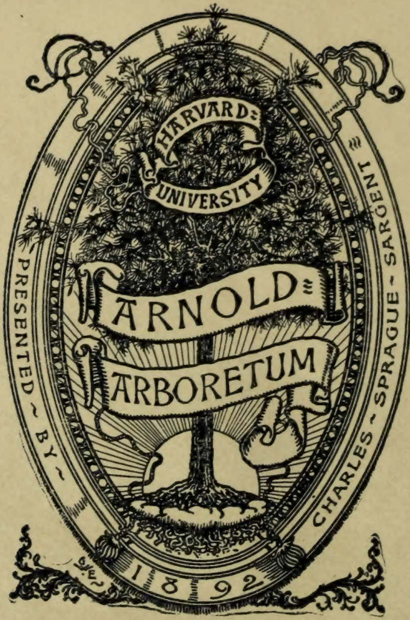
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AGRICULTURAL BULLETIN

OF THE

STRAITS

AND

FEDERATED MALAY STATES.

EDITED BY

H. N. RIDLEY, M. A., F. L. S.,

Director of Botanic Gardens, S. S.

CONTENTS.

PLATES I & II—PINE-APPLE CULTIVATION.

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NOTICE.

THE SCIENTIFIC AND TECHNICAL DEPARTMENTS OF THE IMPERIAL INSTITUTE.

His Excellency the Governor has received a despatch from the Right Hon'ble the Secretary of State for the Colonies calling attention to the advantages offered by the Imperial Institute to Merchants, Planters and others, who may wish to have samples submitted to scientific experts for opinion as to their commercial value, &c. The following extracts from a Memorandum published by the Authorities of the Imperial Institute will give an idea of the work undertaken and carried on there.

"The Scientific and Technical Department of the Institute has "been established to acquire information by special enquiries and "by experimental research, technical trials and commercial valua-"tion regarding new or little known natural or manufactured pro-"ducts of the various Colonies and Dependencies of the British "Empire and of Foreign Countries, and also regarding known "products procurable from new sources, and local products of "manufacture which it is desired to export. This work is carried "out with a view to the creation of new openings in trade, or the "promotion of industrial developments."

2. In an extensive and well equipped series of Research Laboratories, a numerous staff of skilled chemists under the direction of Professor WYNDHAM R. DUNSTAN, M.A., F.R.S., carry out the investigation of the chemical constitution and properties of new dye-stuffs, tanning materials, seeds and food-stuffs, oils, gums and resins, fibres, timbers, medicinal plants and products, with a view to their commercial utilization. Whenever necessary these materials are submitted to special scientific experts, by whom they are made the subject of particular investigation or practical tests. Reports are also obtained from technical or trade experts in regard to the probable commercial or industrial value of any such products, while full information is collected from official or other trustworthy sources regarding the probable extent and cost of available supplies.

Reports on the results of enquiries or experimental investigations are supplied as a rule, without charge, but should special expenses be incurred in connection with any such reports, or with the commercial value of particular materials or manufactured products, which the Council do not consider themselves warranted in meeting, a statement of such outlays will be furnished, for repayment, when the Reports are supplied. Should an investigation or report of exceptional character be asked for by a Government Department, an estimate of the attendant expenses will be submitted, with a view to ascertain whether authority for such expenditure will be given.

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PINE-APPLES.

The Pine apple (*Ananassa sativa*) of the order *Bromeliaceæ* is a native of South America, probably Southern Mexico, and was introduced very early into the East Indies by the Portuguese, shortly after the discovery of America, as according to LINSCHOTEN, it was abundant in India in 1583, and in 1593 sold for as little as 2 reals a piece (Acosta Hist. Arom. 295). It seems indeed to have spread over the world more rapidly than any other cultivated plant, and probably arrived in Malacca about the same time as it did in India. The name Nanas, or Ananas by which it is known in almost all languages is of South American origin. The Spaniards called it Pinas from its resemblance to a pine cone, and similarly we get the English name.

Varieties of Pine-apples.

The number of named varieties of pines is very large. Each country giving special names to its varieties. Unfortunately most of these varieties have hardly been adequately described, still less figured or classified. Mr. D. MUNRO, in the Transactions of the Horticultural Society of London 1835, gives a list of fifty-two kinds, which could probably be largely supplemented now. The plant varies in the colouring and presence or absence of spines on the leaves, the colour of the outside of the fruit, and the flesh and in size. The earliest cultivated appear to have been very small, about the size of an orange, and seem to correspond to what is now known as the Mauritius pine.

Among the best known named kinds from various parts of the world are—

The *Smooth Cayenne* or *Giant Kew*, apparently identical with what is known in some places as the King pine. It has bright green long and broad leaves without thorns on the edge or but few and bright yellowish green cylindric fruit. The bracts often tinged with red. This pine is the one commonly sold in London, being imported from the Azores, and it or a closely allied form is cultivated in the fields in the Straits for tinning. Its weight when full sized is 8½ lbs.

The *Queen pine*, including the forms Golden Queen, Egyptian Queen, Red and Green Ripleys, Jamaica Ripley. *Ananassa ovalis* of Millers dictionary has short bluish green leaves armed with distant strong thorns and a yellow fruit, ovoid in outline. Weight 3 to 8 lbs.

The Red pine of Miller's dictionary is either a sub-variety of this or is the Red Jamaica Pine known in the West Indies and elsewhere, also as the Sam Clarke or Goffe Pine. The pine most common in the fields here is to be referred here I believe. It is a medium sized pine with often reddish leaves and dull red fruit cylindric in outline and not tapering upwards, the flesh white or more usually yellow. This field pine is rather flavourless or apt to be so when fresh, but develops a good flavour when tinned, and is very widely grown for this purpose.

The *Black Jamaica* or *Black Spanish* has dark green leaves shading to a blue purple in the centre, with short hooked prickles on the edge. The fruit is fairly large dark green with often a purple or blackish tint somewhat pyramidal. This is an excellent eating pine, and weighs 4 or 5 lbs.

The *Sugar loaf*, *Ananassa pyramidalis* of Miller's dictionary, has a conic fruit tapering upwards, bright yellow with yellow flesh. It is one of the largest pines, and the big pines weighing from 14 to 28 lbs. generally, I believe, belong to this class of pine. It is not used for tinning but is a popular and handsome eating kind.

The *Abbazaxi* of Brazil is one of the finest flavoured pines but seems to be rare in cultivation. The flesh is quite white, with hardly a trace of yellow, very soft and juicy.

The *Montserrat pine*, (*A. viridis* Miller's dictionary) has a pyramidal greenish yellow fruit and the Havannah pine *A. glaber*, Miller, is described as having only a few teeth at the tip of the leaf and probably belongs to the group of King pines.

The *Mauritius pine* is very well known in the Straits. It has narrow leaves of a distinct reddish colour, and very small bright yellow cylindric fruit usually about 4 to 6 inches long, the flesh is rather firm and yellow, and of exceptionally delicate flavour, too small for ordinary tinning but considered the best eating pine here. It is perhaps what Miller calls *Ananassa serotina* the St. Vincent or Green olive pine.

The *Spineless Guatemala pine* is described by Mr. J. C. HARVEY of Mexico who sent suckers of it to the Botanic Gardens, Singapore, as having smooth leaves without spines. A smooth not shouldered nor conical fruit, weighing about 7 lbs., the flesh almost white. He recommends it as a high class fruit.

Among ornamental and curious pines the variegated pine with leaves marked with red and white and a bright red fruit, is well known in gardens. The fruit which is very handsome is usually rather poor in flavour. A very ornamental kind has reddish green leaves and a crimson red fruit, very showy but poor eating.

Hen and chickens pines with a number of small fruits surrounding the big central one, which is yellow and has the conic shape of the Sugar loaf pine is a well known curiosity.

Propagation.

Pines can be propagated by means of the off shoots or suckers from among the lower leaves of the plants. They are pulled or cut off and allowed to dry a little in the sun and then planted. Some planters in other parts of the world recommend that they should not be allowed to dry thus, but this depends really on the humidity of the season and climate. These suckers if sufficiently dry will travel well for a long distance. They should be wrapped in tinfoil or some such material. If sent damp they will quickly rot as they will if packed at all damp in bulk. Several suckers of the Spineless Guatemala pine were lately received from Mexico sent through the post wrapped in tinfoil by Mr. J. C. Harvey and arrived in the best condition. These suckers should fruit in 12 to 15 months after planting. Some varieties of pines send out subterranean shoots, ratoons which can be utilised. The suckers selected for planting should be according to a writer in the Jamaica Bulletin, strong fresh ones 12 to 15 inches long, but those used here are generally much shorter. The lowest leaves are usually pulled off before planting so as to allow a bare piece of stem to fix the plant in the ground.

Slips or suckers from the base of the fruit above the leaves produced in some kinds of pines are used for planting. They are stated to take not less than 18 months to produce fruit, being slower than the suckers from below the leaves but the fruit is larger and better. It is recommended that these slips should be removed where possible from the base of the fruit as they are injurious to the development of the fruit.

The tops or crowns of the fruit can be planted if necessary, but this is not recommended except in exceptional cases, as they are very slow of growth. It is not at all uncommon to see plants growing along roadsides or in waste ground which have sprung from tops thrown away by some one who has been eating pines in the neighbourhood.

Seed is occasionally produced but not often at least in the Malay Peninsula and pines containing seed are generally inferior in texture and flavour. They can be used if required for planting but are practically only sown in the case of hybridization which is occasionally done in the West Indies and Florida.

Soil.

The soil used for pine-apple culture in Singapore is the ordinary earthen stiff clay soil of the small hills which cover the island. Most of these hills have been previously used for pepper and gambier, and then abandoned, and often are covered with low secondary scrub which is burnt and the ground dug over before planting. The soil is usually very poor, especially in potash

phosphates and lime. Richer soil does not seem to suit the pine-apple better, but the plant does not appear to be very particular as to its habitat so long as the soil is free and open, and not damp or low lying.

Under shade the pine-apple grows and develops long leaves but little or no fruit and that very inferior.

That pines will grow in the very poorest soil so long as they have suitable drainage is shown by the cultivation in Florida where they are grown in hundreds of acres on coralline rocks covered with a thin layer of soil, without the use of fertilizers.

Pines grown in low lying damp ground do not thrive. They fruit badly and are more liable to disease.

Planting.

The Chinese plant the pines in rows, each plant 2½ to 3 feet apart with a path of about 4 feet width between each row so that they can hoe out the weeds between the plants. The Bugis planters plant them about the same distance apart but without a wide path between, each row forming beds about 40 or 50 feet long, the paths being between each bed. The best plan is to plant them in rows 2½ feet apart with a five feet path between every 3 or 4 rows. In any case the plants should not be more than 2½ to 3 feet apart.

The fields require careful weeding, but are not generally manured here. The first pines are produced from the suckers in from 12 to 18 months. After the ripe fruit is removed the suckers should be cut out leaving only two or three of the strongest. If all the suckers are left they will produce fruits next crop perhaps as many as a dozen, but the fruits will be small. If only one or two are left the fruits will be much larger.

There are three crops in the year, November to December, February and March and the biggest in June and July, but the crops depend very much on the rainfall. When there is a spell of dry weather of long duration the pines do not fruit.

A properly cared for estate as cultivated in the Straits Settlements lasts five or six years, but the pines gradually get smaller. If neglected it lasts but 2 or 3 years. Doubtless an estate could be carried on for very many years and there is a record in the West Indies of a pine-apple field lasting for sixty years. Pines remain on abandoned ground for very many years and go on growing, but when over crowded or covered with scrub produce few or no fruits and those that are produced are small and poor. In long grass and bush under shade the leaves often attain a great length 8 or 9 feet, and these are suitable for making fibre.

Manuring.

Manure is not commonly used in the Malay Peninsula on the large estates, but the Chinese occasionally apply a small quantity of cowdung, burnt earth, etc. For tinning pines which require to be cheap it would not be worth while to go the expense of manur-

ing. In Jamaica, however, where pines are chiefly grown for the fresh fruit market and consequently a finer class of pine is required, manuring seems to be considered advisable if not necessary. It is recommended (Jamaica Bulletin VIII, 1901, p. 139) if the soil be poor and arid to fork in or plough in a good dressing of farm yard manure, when breaking up the soil 6 months or so before planting, and give a top dressing of wood ashes after the plants have started to grow. Artificial manures are also largely used by growers in the West Indies. In clayey soils the application of lime when preparing the ground is found highly beneficial and soils that have become exhausted by other crops may be made suitable for pines by growing a crop of cow peas and ploughing them in when in flower."

A Jamaica planter, Mr. SMITH (Jamaica Bulletin VII, 1900) writes on his experience with fertilizer thus: "The best results so far I have obtained have been from 550 lbs. of cotton seed meal per acre combined with 100 lbs. of high grade sulphate of potash at time of flowering, I do not seem to get any results at all from phosphoric acid. Stable manure (from horses) should never be used no matter how thoroughly rotted. The manure from cattle may be used with splendid results."

Mr. COUSINS in the Jamaica Gleaner Nov. 2, 1903, gives an excellent report on the use of fertilizers in Jamaica of which the following extracts are of interest:—

"No results whatever from fertilizers were observed at any centre except Clover, near Mandeville, where the results were quite striking.

The Rowington results were not encouraging. It appears likely that after the heavy rains a good deal of surface rooting took place and that the plants suffered from scorching when the drought followed and the full sun beat down upon them later.

"On the red soil from the limestone in St. Ann (Huntly), fertilizers produced no effect. This soil is apparently quite rich enough for pines without assistance.

At Barbican, on the light alluvial soil of the Upper Liguanea plain, fertilizers were quite inoperative. This soil is apparently richer than the maximum requirements of the pine in plant food.

At Billy Dun, on a similar soil with less humus and exposed on a hilly slope to intense heat, fertilizers were alike of no avail; the plants suffered greatly from scorching.

The experience of the Hon'ble PHILIP CORK, when he grew pines at Barbican, is in agreement with these results. Even enormous doses of fertilizers proved ineffectual when applied to the pines.

The phosphate fertilizers had absolutely no preventive effect on the formation of "cockscombs" on the United Fruit Company's plantation.

At Clover, on the red soil of Mandeville, the pines were grate-

ful for manure, and Mr. PALACHE has ascertained from the experiments that the complete manure, 2 cwt. sulphate of amonia, 4 cwt. mixed phosphate, and 2 cwt. sulphate of potash, applied to plot 2 gave the biggest fruit and fruit of the best quality.

The analyses show that this soil is of low fertility compared with the others.

On the St. Catharine soil, 80 per cent. of the Smooth Cayenne may be expected to produce monstrosities. The high content of nitrogen (six times the normal and sixteen times that of the Florida soil) is undoubtedly one of the chief causes of this extraordinary vegetative exuberance."

As has been mentioned pines are here usually grown without manuring at all and it is perhaps noteworthy that the soils best adapted here or rather most largely used for pine cultivation are remarkably deficient in potash and lime. It is however, to be remarked that the pine fields of the Straits last a considerably shorter time than those of the West Indies, and the field pine is decidedly poor in flavour for dessert purposes though it seems well suited for tinning. The ordinary resident is quite satisfied with the tinning pine, although he often grumbles at the poorness of its quality, and he does not seem to be aware of the fact that a better class of pine could easily be grown here for direct eating with very little trouble.

The Chinese are said here to increase the size of pines by cutting out the terminal shoot. This though producing a large pine diminishes its sweetness.

Amount of Pines per acre.

The yield of pines in a crop in the West Indies appears to be in good estates from 8,000 to 15,000 per acre. In the Malay Peninsula it is usually about 5,000. But much depends on the growth allowed as explained above if all the suckers are left on the plant they will all produce pines though small, while if only one or two at most are left on the plant the pines are larger and better.

Cost of Pines.

The cost of pines varies from time to time according to the supply, which depends on the season and on the weather. In Singapore pine-apples can be obtained pretty nearly always throughout the year. At the present time they sell at from one to seven cents each, but they are usually about four cents apiece. Before the tinning industry developed the prices were very low. Thus in 1850 (Logan's Journal III, p. 79) Mr. THOMPSON states that they were sold at 10 for a cent.

(To be continued).

PLATES.

Plate I, a Cart-load of pine-apples brought to the factory. (Photo. A. D. MACHADO).

Plate II, Pines for tinning, Singapore. (Photo. A. D. MACHADO).

Photo by A. D. M.

Pines as brought to the Factory, Singapore.

Photo by A. D. M.

Pine-apples for Tinning, Singapore.

EARLY EXPERIMENTS IN COTTON PLANTING IN THE STRAITS SETTLEMENTS.

The following extracts from Logan's Journal will doubtless prove interesting to many readers. The work in which they were originally published is so rare and difficult to procure now that apologies for reproducing them at a time when all available information on the cultivation of cotton in the Empire is in all men's minds, are unnecessary. The experiments in cotton growing were carried on some years after this report was written but as in so many other parts of our colonies died out, as it was not possible to compete with America. It will however be remembered that in these early days the Malay States were not available for planting, and the area, and soils adaptable for the cultivation in the Straits Settlements were small and hardly suitable. Times have changed since then, and we have now a better choice of land on which to experiment and it would be well worth while to try again.—Ed.

ON THE CULTURE OF COTTON IN THE STRAITS SETTLEMENTS.

The elements necessary to the cultivation of cotton on a large scale are extent of territory, soil, climate, labour, intelligent superintendence, and capital. The extent of territory adapted for the better description of cotton, which according to experience does not arrive at perfection if grown at a distance from the sea coast, is limited to the island of Singapore and Penang, with about 40 miles of coast line in the Malacca territory, and 25 miles in Province Wellesley, but should a greater extent be required, no difficulty will be experienced in obtaining the entire western coast or readily turn it over to Government for annual pensions.

Climate.—This is the only point on which any doubts are likely to be raised with regard to the successful culture of cotton in the Straits. Singapore, the only Settlement in which it seems to have been attempted, can scarcely be said to have a decided dry season, and the failure of the experiments made by the late Sir JOSÉ D'ALMEIDA about 10 years ago was attributed to this cause. The seeds introduced were those of the Bourbon cotton, with a long and fine staple, and the Pernambuco variety, with a long but harsh and wooly staple, both of which were perennials. The plantation was formed at Tanjong Katong, near the beach, on a sandy soil enriched with decomposed vegetable matter, and evidently well suited to the plant, for it throve vigorously, put forth numerous blossoms, and produced cotton which was highly approved of by judges of the article both in Bengal and Great Britain. But there was no regular crop. The pods opened throughout the year, and if allowed to remain in that state on the tree until a sufficient number had accumulated to repay the labour of picking, the heat of the sun and the moisture combined were calculated to draw the oil from the seed, discolouring the fleece, and consequently deteriorat-

ing its value. The trees had, therefore, to be constantly watched, and the amount of labour required to collect the crop rendered the speculation unprofitable. The failure was attributed to peculiarity of climate, but it seems rather to have been owing to peculiarity of the perennial variety of cotton, which is liable to flower in tropical climates at all seasons of the year. This variety has long ceased to be cultivated as a staple product, on this very account. Formerly it appears to have been the only known species, if it can be so called, for the annual variety now cultivated in the United States and elsewhere was orginally a perennial.

A similar state of affairs may be witnessed in our immediate neighbourhood. Cotton is cultivated as a perennial in every island of the Archipelago as far to the eastward as New Guinea, but never with a view to a crop. The plants are scattered about the gardens of the natives, and are visited daily by members of the family to collect any pods that may have opened. It is only in Java, Bali, and Palembang (the latter was colonized from Java) that cotton is planted as an annual, and singularly enough these are the only countries that produced it in sufficient quantities to form an article of export, or of large domestic consumption.

The introduction of the annual variety in Java was also the result of necessity. The inhabitants of the plains had no means of growing cotton except on their rice lands, which are flooded during a portion of the year. The seeds are sown in June, after the rice crop has been gathered, and in November the lands are flooded and the plants destroyed, so that only four clear months are allowed for the collection of the crop from the time the seed is sown. Yet it is believed that more cotton is thus grown in Java than in all the other islands of the Archipelago put together.

When we find this useful plant adapting itself so readily to circumstances, are we to suppose that the Straits Settlements, so highly favoured by nature, are denied participation in the fleecy harvest. It would be treason to think so until the annual variety has been tried and failed. The dry season which ended with last month (October) has surely been sufficiently decided for the collection of a cotton crop, and we have the authority of the Editor of this Journal (vol. II p. 112) to prove that this is in the ordinary course of events at Singapore. I submit that if seeds of the four-months-blowing Sea Island or "Black Seed" cotton are planted in any eligible spot in Singapore during the months of November to February inclusive, there is no peculiarity in the seasons here to prevent a full crop being gathered during the ensuing summer months.

Rain may fall occasionally, but only in showers, and not in greater abundance than on the coast of Florida and Alabama during the cropping season. In October the plants must be uprooted, and the land prepared for fresh seed, and now comes the difficulty that has hitherto prevented the introduction of the finer descriptions of cotton in countries within the tropic. The plant is still in full bearing,

and it seems utter wantonness to destroy it. But it must be done, or there will be no regular crop during the next season.

Superintendence.—This is the most important element of successful cotton planting, and a superbundance of all the others would be of little avail if a deficiency existed in this particular. The Anglo-Americans could never have availed themselves as they have done of the necessity for renewing the plants annually, if they had not been able to bring into action a body of intelligent planters, to watch the changing of the seed, year by year, until the staple attained the closest approach to perfection. It is well known also that the efforts of the East India Company to improve the general produce of Hindoostan, carried on through a long series of years, without regard to expense, have been rendered abortive by the absolute impossibility of providing intelligent superintendents for such an immense extent of cotton lands. The model plantations they established under American and European superintendence, produced cotton equal to the best samples of the Southern States of America, but the improvement went no farther. The native cultivators would almost as readily change their religion as adopt a different mode of culture from that followed by their forefathers, and the general crop continues to be the same description of rubbish as before, which scarcely pays the freight to Europe. It remains to be seen whether the Chinese will shew the same readiness in adopting European improvements in this instance that they have evinced in others. But should the culture be successfully introduced here, and the Chinese display their usual spirit of imitation, improvement would soon spread to Sumatra and Borneo, in fact over the entire Archipelago.

The experiment can now be carried on more favourably than on the former occasion, when the European inhabitants all resided in the town and vicinity, only visiting their country plantations occasionally. Now many reside permanently in the interior, and can therefore give daily attention to the experiment. At Penang, also, where much land has been cleared for sugar plantations, the cultivation of which has in some instances been abandoned, the proprietors may follow the example of the West Indian planters by converting their abandoned estates into cotton plantations.

G. W. E.

Appendix.

Extract from Col. Low's Dissertation on the Soil and Agriculture of Penang and Province Wellesley :—

Cotton has never been extensively cultivated at this settlement. It has, however, been long introduced, and the staple of one of the varieties now cultivated, but whence obtained cannot be easily ascertained—is of a very superior quality. It thrives luxuriantly on the light as well as the stiff soils, and equally well on the hills, as in the valley. The chief obstacles to the cultivation are, the price of labour, and the sudden vicissitudes of climate from dry to wet, the latter being apt to injure the pod.

Bushes of the above mentioned variety which has a yellow blossom have been observed, for the last six years, in almost constant bearing. They being to bear in six or eight months after planting.

The following calculation was given to me, several years ago, by an intelligent Chinese who intended cultivating cotton, but abandoned the project for one more lucrative.

One hundred orlongs (about 130 acres) will contain 435,600 bushes and each bush will yield, annually, 50 buds of cotton, or one tael—which is the lowest averaged rate—being 272 piculs and 25 catties for one year's produce.

The expense of cultivation and cleaning the cotton—about 1,100 dollars, after the first cost will be nearly 2,000 dollars yearly.

(*The Journal of The Indian Archipelago and Eastern Asia, 1850, Vol. IV page 720.*)

REMARKS ON THE CULTIVATION OF COTTON IN SINGAPORE IN 1837.

By T. O. Crane, Esq.

In your number for December I find an essay on the Culture of Cotton in the Straits Settlements Your talented correspondent has not taken that ample view of the subject which he might have done, or has been misinformed with regard to the experiments made in Singapore. As my experience does not extend beyond this island, your readers must remember that I treat only of Singapore, as the same difficulties may not exist in our sister Settlements. On the Malayan continent I doubt much that they do exist, and as regards Malacca I shall offer some remarks on another occasion.

Your correspondent has quoted from Mr. G. R. Porter's "Tropical Agriculturist" some remarks regarding soil, of the correctness of which there does not exist a doubt. In the preceding paragraph to that, he says "the extent of territory adapted for the better description of cotton is limited to the Island of Singapore and Penang." As I am treating of Singapore only, I would ask him, what land there is now available, and adapted to the culture of cotton on this Island? The only belt that offered any chance of success, is that now occupied by one entire field of coco-nut trees, from Sandy Point (or Tanjong Rhu) to Buddoo (Bedok). There may be a few acres between that and Tanjong Changi, but not sufficient ever to make Singapore a cotton growing Island, were it in every other respect successful. The belt of land extends from the sea to the Siglap road, and eastward only to Arthur's Seat. The flat north of that road, known as the Paya Lebar district, is partially cultivated with cocoanut trees and sugar cane, moreover the soil is not at all suited for cotton.

Before I commence my remarks upon the culture of cotton in Singapore with my opinion, resulting from nearly three years of actual experience, labour, and outlay of capital, I must correct your

correspondent in other points, on which, had he taken a little more pains, he would not have erred. In speaking of the climate he says, "This is the only point on which any doubts are likely to be raised &c." and goes on to say that "Singapore the only settlement in which it seems to have been attempted, can scarcely be said to have a decided dry season and the failure of the experiments made by the late Sir JOSÉ D'ALMEIDA about 10 years ago were attributed to this cause.' Your correspondent might have said that Singapore has decidedly no dry season, and not the climate, but the want of a dry season, was the cause of the Cotton not ripening in sufficient quantity at the same period to render it profitable to the cultivator.

He says "the seeds introduced were those of the Bourbon cotton with a long and fine staple and the Pernambuco variety, with a long but harsh and woolly staple both of which were perennials."

I shall now proceed to give you an account of the experiments made by myself, at the time that the late Sir JOSÉ D'ALMEIDA made his experiments. We were brother labourers in the same cause, and cultivated a similar soil, and our operations generally were carried out in the same manner, with only perhaps a different opinion as to the kind of cotton most likely to succeed.

I commenced clearing ground at Tanjong Katong in February 1836 fifteen years ago. Sir JOSÉ first sowed the Pernambuco seed about March he having at the time several plants of that kind in his garden at Kampong Glam. It was I believe originally introduced from Rhio, and as a garden plant it throve well and produced excellent cotton. The first seed I obtained, was from Sir JOSÉ, I put it in the ground on the 26th April, and it came up vigorously, but we soon found that the young plants were very much attacked by the large grass-hopper or locust, the head nipped off and consequently the plant destroyed. We then had little conical bamboo baskets made, to protect the young plants, but for a time we were as much troubled, with quite as active an enemy. During the night our baskets were all capsized by the monkies, then abundant in the neighbourhood out of sheer mischief or curiosity, for they seldom meddled with the plants further than exposing them. On the 14th May I had collected a small quantity of the seed found in Singapore, supposed then to be indigenous to the Island. Of this species we found several plants in front of the late Baba Whampoa's coconut plantation fronting the beach at Tanjong Katong and a few plants up the Gaylang river (undoubtedly planted there) near the hut of a Malacca man, but this proved to be the Bourbon cotton. It was known by the Malays as *Kapas Murice.*

The Bourbon came up well and appeared to me more likely to succeed. My neighbour the late Sir JOSÉ was still in favour of the Pernambuco, and he having abundance of seed from his garden at Kampong Glam, planted out several acres of it, I preferring the Bourbon, had by the end of August 5 to 6 acres planted out with that kind. In the mean time I had written to my brother W. C. CRANE, who was then residing in Calcutta, to send me a quantity of all kinds of seeds procurable from the Agricultural and Horti-

cultural Society of India. Before the close of the year I had received from that Society through him abundance of Upland Georgia, New Orleans, Egyptian, Peruvian, Sea Island. I also received a small quantity of Tinnevelly and had obtained two kinds from Manila, the white and nankeen colored. The whole of those kinds were tried during the year 1837 and part of 1838, and without an exception all failed as a remunerative speculation. It would be useless for me to go into detail, with respect to our operations during the space of nearly three years. I will simply give an outline of the result of each kind of cotton planted by the late Sir José and myself, and some reports on samples sent to Calcutta and England, which will close my answer to your correspondent's first letter. As I see he has continued his essay I shall continue to give the agricultural amateur for cotton culture my opinion as to the likelihood of its future success, and offer some general remarks for those who may feel inclined to try it here, or elsewhere. I sincerly hope your correspondent will not attribute these remarks to any wish on my part to dampen any enterprising spirit that may wish to increase cotton cultivation in our colonies, or in the Straits. Nothing can be more desirable, and every means ought to be resorted to, to attain so great a boon to the mother country.

Pernambuco Cotton.

Of this kind I had about 3 acres well up at the end of 1836 and ought to have taken from the field by that time for my first crop 900 to 1,000 lbs. weight of clean cotton, but it did not yield more than 100 lbs. consequently a complete failure. The plants grow to the height of 5 to 8 feet and I have seen some higher. As a garden plant it thrives well, the pods being generally full and come to maturity, but the produce under the most favourable circumstances scanty: in the field the plants appeared sickly and the pods seldom came to perfection, being attacked by a small maggot, destroying not only the seed but also the wool, it becoming discolored by the oil from the decayed seed. I did not continue this kind. My neighbour had a much larger field and continued for a second crop and I believe a third to the end of 1838, at which time our cotton experiments were given up altogether.

Bourbon and Sea Island.

My first experiments in these were apparently successful, with a small patch in a very favourable spot but the first crop of 1836 did not yield the quantity necessary to make it worth cultivating; neither of the kinds ever podded freely at the time they ought to have given a full crop, consequently could not be cultivated as annuals. From accounts received from India regarding the Bourbon, and from America respecting the Sea Island, they are reported to grow about 3 feet high; the plants in Singapore appeared to have altered their nature, here they rose to six feet throughout the field, and some higher, the pods of these two descriptions generally were perfect but too scanty at the time they ought to have yielded a full crop, continuing to flower and pod through-out the year,

consequently subjecting the cotton to be spoiled in the pod, we were also troubled very much by field rats, which destroyed the cotton if not taken immediately from the plants.

Upland Georgia, New Orleans.

And the other kinds were complete failures, the plants not thriving well, here and there some beautiful plants, but showing on the whole a bare and scattered cultivation. The ground occupied in 1837 by the different kinds was about 23 acres, my neighbour Sir JOSE had I believe nearly 30.

The whole produce collected by me, say two crops of 1836, 1837, was 3 bales Bourbon shipped in June 1838 on the "JOHN DUGDALE" to Liverpool weighing 4½ cwt. which was sold at 9¼ per lb. and reported as fair specimen, and 6 bales shipped in December 1838 containing 9 cwt. of Sea Island which sold at 1*s*. 4½*d*. per lb., this was pronounced to be very good, but somewhat mixed, and not carefully picked, which no doubt was the case, our cotton gins being very imperfect. The remainder of my labours I sent to China, about 4½ piculs, making altogether about 15 piculs not more than one quarter of what at the lowest calculation it ought to have turned out for one years crop.

Notes.

Calcutta reports, 11th April, 1837.

On samples of Singapore grown cotton. See Proceedings of the Agricultural Society Calcutta, Vol. IV page 48.

"Presented by Mr. CRANE at the last meeting grown at Singapore from seed originally Pernambuco and Bourbon."

The Pernambuco kind is "decidedly of inferior quality, being coarse, harsh, short in staple, and very weak." Of the Bourbon, Mr. WILLIS reports more favourably. It is fine, and silky, and of pretty good strength of staple; yet not quite so strong as it ought to be: its complexion is good also. "Mr. WILLIS values fhis cotton with reference to the latest advices from Liverpool at about 9*d*. per lb. the seed is represented to be smaller than usual in this description of cotton, but does not consider this as an invariable criterion in contrasting the quality of the wool, and very appositely asks how is it that we sometimes find inedible and other fruits improve in their flavour or the volume of pulpy and fibrous matter when the seed itself become much diminished under improved cultivation."

"Mr. W. C. CRANE submitted some very fine specimen of cotton grown at Singapore from Upland Georgia seed which he had received form this Society in October last and from seed received from Manila. A pod of the latter was without exception the most perfect, beautiful and largest ever grown or seen in India. Mr. CRANE terms it Manila Cotton." From the same; Volume V. page 202.

"From W. C. CRANE, Esq., dated 6th July, 1836, presenting a specimen of Sea Island grown at Singapore from seed forwarded by this Society. Mr. HUFFNAGLE'S report :—

"The specimen of Sea Island cotton grown at Singapore, from American seed by Mr. CRANE, is according to my opinion superior to any of the other samples before me. It is silky; long in staple with a strong and even fibre. I cannot however form a correct estimate of the average quality of the cotton from this plantation as it appears by Mr. CRANE'S letter that he has sent us only a few of the first pods which have no doubt been carefully picked. The soil however "sandy and near the sea" appears to be well adapted for this variety and if the whole crop will bear any comparison with the first portion produced, this experiment at Singapore may I think be considered as very successful."

Reports on further sample sent.

"The Upland Georgia cotton does not seem to be so well adapted to the soil and climate, being woolly, and the seed separable with difficulty, but the staple is good. The Manila appears to be a failure, being harsh, with a short and weak fibre."

Extract of a letter from W. C. CRANE with a report on small quantities of Egyptian and Peruvian both considered failures:—"It is a pity you did not send sufficient Sea Island (2 Maunds) to contend for the gold medal as you had more than sufficient for the purpose, that you sent was pronounced to be the finest grown in India and would have carried the prize easily."

From The Journal of The Indian Archipelago and Eastern Asia. (Vol. V, page 120.)

COTTON IMPORT INTO THE UNITED KINGDOM.

"After the two large groups of merchandise known as breadstuffs and meat-products, the most important factor of the agricultural import trade of the United Kingdom is Cotton, enormous quantities of which are annually purchased to supply the British mills with raw material. For this staple article which is the basis of one of their greatest manufacturing industries, the British people are largely dependent upon the United States. During 1900 there were shipped to the British market from all sources 1,779,000,000 pounds of cotton having an aggregate value of $200,000,000 (gold). Of these imports 1,760,000,000 pounds, worth over $199,000,000, consisted of raw cotton and 19,000,000 pounds, worth $656,000 of waste cotton.

"Of the raw cotton imported the United States furnished 1,365,000,000 pounds, valued at $147,000,000, or 74 per cent. of the total. Next to the United States the most important source of supply was Egypt. The peculiar, long-fibred cotton of that country was imported to the extent of 312,000,000 pounds, the value amounting to $44,000,000, or 22 per cent. The British East Indies also supplied cotton in considerable quantities. From that source 37,000,000 pounds were procured, the value being $3,387,000

or 1.7 per cent. Madras furnished the principal part of these shipments. About 30,000,000 pounds, valued at $3,250,000, or 1.6 per cent. came from Brazil. Peru, Chile and China stood foremost among the countries from which additional imports were received."

Agricultural Imports of the United Kingdom, 1896–1900.
U. S. Department of Agriculture.

PRESERVATION OF BAMBOOS FROM THE ATTACKS OF THE BAMBOOBEETLE OR "SHOT-BORER."

CONDENSED ACCOUNT.

The work of the bamboo beetle or "Shot-borer" is well known in India. All who have anything to do with bamboos have to count upon and allow for the ravages of this pest and in many parts a year to a year and a half may be given as the estimated and probable life of a bamboo after cutting.

But although the results of its work are well known, the real author of the depredations is far from being a well recognised enemy owing both to its small size and to its secretive habits. The damage is committed by a tiny beetle and its grubs which are just of slightly smaller diameter than the holes with which the bamboos are seen to be riddled. The beetle, which has a black head and thorax and reddish-covered shining wing coverts, bores its way into the bamboo and lays its eggs in the interior, each beetle laying about twenty. From these eggs small white roundish dots of grubs issue within a few days of their being deposited. These tiny larvæ burrow up and down in the interior of the bamboo and reduce its structure to powder. About four weeks are spent in this stage and the grubs then enlarge the ends of their burrows and change to pupæ which after some eight days or so turn into the beetles. On becoming mature the beetles bore their way out of the bamboos and so add further to the tunnels already made in them. On emergence the insects fly off to attack fresh bamboos or they may bore into the one in which they have matured themselves. There are thus three separate forms of attack. The matured beetles appear to issue either all from the same exit hole or from one or two only, these being often the former entrance holes of the mother beetles which are considerably enlarged. Beetles of the new generation appear to also make use of these old holes to enter the bamboo to egg-lay, boring away from the old gallery when they have got inside. When bamboos are in lengths it will be found that the beetles tunnel in them parallel to the long axis and from galleries which open at one of the ends. The bamboo is thus often completely hollow in parts without there being much outward evidence of its having been badly attacked. A feature which greatly adds to the insects power of doing serious damage is to be found in the fact that it passes through at least five, and perhaps more, generations

or life cycles in the year. I have said that the insect lays about 20 eggs and therefore one female beetle may produce in the year a progeny of 200,000, on the supposition that only five generations are passed through and that only half the eggs are females (the latter however, are usually in excess of males). If there is a 6th generation the number of females incre ses to 2,000,000.

Taking only 50 per cent of the 5th generation beetles as maturing and laying eggs, we still have 100,000 insects as the progeny of the one mother beetle in the spring. This great prolificness easily explains why bamboos suffer so greatly from the shot-borers attacks.

Towards the end of April of this year Mr. WILLIAMS, the Superintendent of the Telegraph Workshop, at Calcutta, informed me that bamboos which he was converting into field telegraph posts for use in frontier expeditions and elsewhere were being attacked and riddled by insects. The specimens he sent me I identified as the common bamboo boring insect (*Dinodermus minutus*, Lesne). As the question of the preservation of bamboos against this insect had been engaging my attention for some time, I immediately paid a visit to the workshops and examined the bamboos. I found that they were being experimentally treated in the following manner before being fitted up as telegraph posts :—

(1) Five days soaking in river water:

(2) Five days soaking in a solution of copper sulphate, after which they were dried in a covered shed for several days; and then

(3) Soaked for 24 hours in common Rangoon oil. This latter has the effect of darkening the bamboos and the smell of the oil remains in them for some considerable time, although not so offensively as to prevent their being made use of. The treatment lasted about 14 days upon the expiration of which period the bamboos were at once sent to the workshop to be fitted. Mr. WILLIAMS had reported that within three weeks of this treatment some of the bamboos had been again attacked by the borers. As some 9,000 had been through the treatment the case afforded a good opportunity for experiment. I wished to find out :—

(1) How many more generations of the beetle appeared in the year.

(2) Whether the oil treatment was of any use.

(The experiments, which numbered fifty-five, took place between April 29th and October 30th. Male bamboos *i. e.* solid bamboos were placed in boxes constructed of tin foil with close fitting tops of wire gauze and treated in various ways with water, copper sulplate and Rangoon oil both singly and in combination.)

The experiments show I think the following :—

(1) That neither the five days in water nor that followed by a

further five days in Cu So4 are of any use as a protection against the beetles.

(2) That the bamboos which had gone through all the stages of the treatment and had received a proper soaking in the oil tank remained unattacked and in addition were proof against further attacks by the beetles.

(3) That at least five generations of these beetles issued between the last week in April and the end of October. It is probable that many of the beetles of the last generation were killed off by a cold snap experienced toward the end of the month.

(4) That the oil treatment therefore considerably prolongs the period of usefulness of the bamboo, this period being, as far as the experiments at present show, at least a year.

(*a*) I am inclined to recommend that the soaking for five days in water should be continued since a thick shiny gelatinous substance exudes from the bamboos during this process, and this exudation probably enables the bamboo to absorb a larger quantity of oil than would be otherwise the case.

(*b*) That the soaking in the copper sulphate solution be discontinued since the experiments have shown it to have no preservative effect against the beetles.

(*c*) That the bamboos be allowed to dry in a covered shed for several days after the water process.

(*d*) That after the drying the bamboos be allowed to soak 48 hours in common Rangoon oil.

The Superintendent of the Telegraph workshops states that the cost of the treatment as carried through by him, *i. e.* five days in water, 5 days in Cu So4, followed by several days drying and then two separate soakings (at an interval of a couple of months) of 24 hours each in Rangoon oil, amounts to Rs. 3.5 per 100 6-foot lengths or 6.3 pies per length. This includes the labour.

Omitting the Cu So4 treatment and a second soaking in the oil together with the additional handling involved should effect a saving in this price, although of course the longer period of soaking in oil will enable the bamboos to absorb more of this than they would in the shorter one of 24 hours only.

E. P. STEBBINGS,

The Indian Forester, December, 1903.

(*Note.*—It will be remarked that the bamboos experimented on were only soaked in water for five days. This we do not consider nearly a sufficient length of time and usually soak them for two months, after which they are not attacked by beetle.—Ed.)

COCONUTS IN THE COCOS-KEELING ISLANDS.

"In some respects the methods of cultivation of the palm adopted by Mr. ROSS do not coincide with general practice, and a few facts respecting the points in which Mr. ROSS'S experience has induced him to depart from the common custom, may be of interest.

"Seed nuts are taken from any palm of the Sea Island species without regard to its age. Eighty trees are planted to the acre, care being taken to avoid regularity in "lining". The reason for this is that the wind does less damage when the trees are not in rows. Another very wise precaution to prevent the palms being uprooted by the wind is to plant the seed nuts at the bottom of holes 3 feet deep. The holes so dug are not filled up by hand seeing that the light sandy soil fills up the holes in the course of time. The roots of palms planted in this manner are naturally deeper and better covered than those of trees grown from seed embedded in the usual manner, immediately below the surface.

"It is stated by Mr. ROSS that a series of experiments has proved to him that nuts which are allowed to fall contain an average of 10 to 12 per cent. more copra than an equal number of carefully picked nuts.

"Though at times the islands have suffered to some extent from the ravages of coconut beetle, yet men are never employed to capture and kill these pests. The trees which show signs of harbouring beetles are cut down and burnt."

A. S. BAXENDALE.

Colonial Reports, No. 402.

RHINOCEROS BEETLES IN SOIL.

The annexed letters from Mr. DELL of Teluk Anson, Perak, give an account of a great outbreak of the rhinoceros beetle *Oryctes rhinoceros* in Perak and the means taken to destroy the insects. The interesting thing about this is that the larvæ seem to have been living in ordinary soil. I have found the grubs abundant in decaying sawdust, cowdung and rotten leaves and wood, but have never known previously of its occurring in ordinary soil which, as a rule, does not contain enough nutriment for it. The soil must have been very rich in decaying vegetable matter. The plan of flooding the ground seems to have answered most satisfactorily. It would probably be also advisable, if possible, to let the grass and low herbage grow over the ground after this has been done, as I observed on a previous occasion in a tannery in Singapore, where a vast quantity of rotten tan bark had accumulated and was of full beetles and grubs when on the abandonment of the ground the soil was covered with low scrub the beetles and grubs quite disappeared. After a year or so when the insects had gone the scrub could be cut down again if necessary.

THE STRAITS PLANTATIONS CO., LIMITED,
Bagan Datoh,
LOWER PERAK.
29th Oct., 1903.

H. N. RIDLEY, Esq.,
SINGAPORE.

Dear Sir,—I am taking the liberty of sending you by the favour of Mr. PENN, the Chief Officer of the s. s *Malacca*, a bottle containing larvæ of beetle which have been found on this estate, and I shall feel very much obliged if you will kindly let me know your opinion of them —whether any, and which of them, are the larvæ of the coconut beetle.

We have suffered a good deal from the coconut beetle lately, and on making strict search we have found many thousands of grubs in the soil similar to the specimens which I am sending you.

The top soil here is a black mould compound I imagine of decayed vegetable matter, and it is in this mould that the grubs have been found. As soon as we discovered the grubs we flooded the whole place with water, with the result that we have picked up over 40,000 grubs dead, and we have caught during the last month over 30,000 grubs from places which the water has not reached. Even in the roads running through the estate, made up of stiff clay, we are now finding the grubs. I imagine that they have got up into these higher places in order to get away from the water.

Apparently it is a very difficult thing to distinguish the grub of the coconut beetle from that of other beetles which do no harm to coconut trees, and having read your article in Mr. FERGUSON'S book and also in the Agricultural Bulletin I should value your opinion on the specimens which I am sending very highly indeed.

I would like to say that since the estate has been covered with water the number of beetles caught has decreased enormously and very few trees have been newly attacked.

We are of course particularly careful to burn all rubbish and manure in which beetles are likely to breed, and if you can suggest any method, other than that which we are adopting to prevent them breeding in the soil, I shall be very grateful.

If there is any other information which you would like to have I shall be very happy to supply it.

Trusting that I am not giving you too much trouble.

I beg to remain,
Yours faithfully,
WILLIAM DELL.

THE STRAITS PLANTATIONS CO.,
Bagan Datoh,
TELUK ANSON,
12th Nov., 03.

Dear Sir,

We have found pupæ and live adult coconut beetles in the soil together with these grubs, so I think there can be little doubt that many of the grubs found are those of the coconut beetle. We have also found in the soil the beetle which I take to be the one you mention (*Xylotrupes Gideon*) together with very similar grubs. This beetle is of lighter colour than the rhinoceros beetle, and has what I should describe as a double horn. It hisses furiously when caught. We have these also on the branches of coconut trees but never in the young shoot, and I do not think that it does any damage.

I am very glad to say that the result of the flooding is extremely satisfactory as the number of beetles brought in has been very greatly reduced. Formerly 2 men were bringing in 50 or 60 a day between them, and now, with 4 men working, only from 10 to 15 beetles are brought in per day.

Owing to other reasons we have been obliged to let the water off, but I am afraid that if we are to cope successfully with the beetle we shall be obliged to flood the whole estate periodically. In the native kampongs about here very little drainage is done and the places are consequently very wet and they suffer very little damage from beetles.

Again thanking you for your letter.

I remain,
Yours very truly,
W. DELL.

KNOTS ON PARA RUBBER TREES.

From Mr. BURN MURDOCH, I have lately received some knots or burrs from Para rubber trees sent him by Mr. C. GORDON BROWN of Selinsing Estate, who feared that they might be due to the Ceylon canker fungus. These knots are very common in Para rubber trees as well as many other trees especially those with smooth bark. They consist of balls of wood easily detached from the trunk, by a blow, and are covered with bark. The wood is perfectly sound, white and hard, and there is no signs of decay in or round them. They are perfectly harmless and have no connection with any fungus or insect-bite but are due to the irritation caused by suppressed buds in the stem. They often appear on a tapping mark. The cut having been made through or close to a bud, it commences to grow but does not develop and is covered up again by the growth of wood over it. The only objection to them is that they often

interfere with the tapping cut, but they are easily knocked out if so, and if left are usually covered up eventually by the later growth of the trunk and so disappear.—Editor.

———o———

Astychus Chrysochloris attacking Para Rubber.

The following letter from Mr. R. PEARS was accompanied by a number of specimens of the pestilential beetle *Astychus chrysochloris*. The life history of this insect was described by Mr. L. WRAY in Perak Museum, Notes II, 1, 1897 (under the name of *A. lateralis*), a very inaccessible publication, and a short resumé was published in the Bulletin, First Series p. 270. The beetle eats leaves of almost any plant, and occasionally appears in large numbers, though by no means always to be found. The grubs appear to live in the soil and feed on decaying vegetable matter, and as there is consequently an unlimited supply of food both for larva and adult it is only remarkable that it is not more abundant and destructive. The most curious thing about them is that the grubs appear to prefer clean weeded land, of loose texture and disappear when the ground is turfed or weedy, which is another argument against excessive weeding of estates. Hand picking seems to be the only remedy likely to be effectual, and this is easy enough as the beetles are very slow in their movements. The animal is thus fairly easy to deal with if it confines its attacks to young Para rubber trees but would be very difficult to get at in full grown trees. Flooding the ground to kill the grubs would doubtless also prove effective and would not injure the rubber trees.

Mr. PEARS description of the beetle gives a fairly good idea of it for it is unmistakeable from its green colour and golden scales easily rubbed off. Both sexes however, are alike, they are however, hatched out without the scales, and nearly black in colour, soon putting on the golden green colour, and perhaps the dark females seen by Mr. PEARS were either young ones or old ones with the scales rubbed off.—Editor.

LANADRON ESTATE,
Muar, viâ Singapore,
Straits Settlements,
21st Nov., 1903.

Dear Mr. RIDLEY,

I am sending you under separate cover some specimens of a beetle which I found vigorously devouring the leaves of some Para Rubber trees of about a year old. Both male and female are included amongst the specimens, the former being of a yellow, whilst the latter is of a greyish black colour. This yellowness on the back of the male seems to be analogous to the "feathers" on a butterfly's wing, for it is easily rubbed off with the fingers, leaving the male almost, if not quite identical in colour with the female.

This beetle seem to be a very voracious eater and shews a particular liking for the young leaves which are still yellowish-green or even for those that are yet bronze coloured. They eat away the whole of the leaf, leaving nothing but the stem which rapidly dries up and easily break off in the hand. By this means they quickly render a tree devoid of young leaves.

I have only as yet found some half a dozen trees attacked by these beetles, but from these trees I must have caught at least 150 specimens in the course of half an hour. The grubs of these beetles I have not yet discovered.

If you could give me any information about these beetles, I should be very much obliged to you if you would give it either by letter, or, if the beetles are not recognised as "pests" in this country, through the medium of the "Bulletin."

I am, yours faithfully,

ROGER PEARS.

A CASTOR-OIL PEST.

Ophiusa Melicerte.

Recently a castor-oil bush in the Gardens was found to be quite devoured by Caterpillars, which although few in number had left but few fragments of leaves on the plant. The caterpillars which were nearly all full grown on November 2, were smooth half-loopers $2\frac{1}{2}$ inches long. The head was mottled with black and white with a large eye like white patch on each side. The body rather slender was finely mottled dark blue grey, or blue, or white black grey and brown ; a broad black central band ran down the back and there were a row of velvety black spots above the brown spiracles, and a red brown band below them, the belly was reddish with distant black blotches, in some examples the whole body was mottled blue. The legs were reddish or white blotched, towards the tail on the back is a short horn like process emarginate at the top and black tipped with red.

The caterpillars were indeed very variable in colour, they were very active springing to the ground when disturbed and hiding in the grass. The following day some had spun up in the leaves of the plant. The chrysalis was $1\frac{1}{2}$ inch long, thick and covered with a bluish bloom. The first moth appeared on November 14th others two or three days later so that they remained about 10 days in the pupal state. The moths were two inches across the wings, the antennæ slender, head and thorax umber brown, the body grey. The upper wings dark umber brown, with a rather darker bar towards the tip, and a transverse silvery grey streak towards the base with a broader band behind it, the lower wings velvety black with a transverse silver white bar and four white spots on the edge, on the other side the wings are dark and light gray with a central

white blotch on the upper wing. The moth is nocturnal hatching out from the chrysalis after dark, and coming to light.

This species appears to be a form of *Ophiusa Melicerte* a widely distributed moth, and known to feed on castor-oil as well as other plants. The form however is darker brown and less red than the Ceylon form figured in Moore's Lepidoptera of Ceylon.

It seems to be less common here than the allied *O. Serva* which is rather lighter colored, and is very abundant at light. Should this caterpillar appear in sufficient numbers to be destructive to any plantations of castor oil, it would be comparatively easy to catch it by shaking the plants over a net or cloth, while the moth might be disposed of by lights over water or by the ordinary moth traps.

REPORT ON BLUMEA BALSAMIFERA FROM SELANGOR.

By Prof. W. R. Dunstan.

This consignment of the dried stem and leaves of *Blumea balsamifera* was received from the Assistant Superintendent of Forests and Gardens, Penang, and is referred to in letters dated 28th May and 16th October, 1902.

The plant is stated to be widely distributed in the Federated Malay States and the present sample was collected in the State of Selangor. It yields a variety of camphor which is largely used by the Chinese, under the name of "Ngai Camphor", in medicine and for perfuming the finer qualities of Chinese ink.

"Ngai Camphor" consists essentially of *laevo-borneol* a substance closely resembling and nearly related to ordinary camphor, which it could no doubt replace for many purposes if obtainable in large quantities at a comparatively small cost. The present consignment of *Blumea balsamifera* however furnished only a minute quantity (0.05 per cent) of this substance which could not therefore be profitably extracted. It is possible that the yield of the camphor obtainable from *Blumea balsamifera* may be dependent upon the stage at which the plant is collected, and it would be worth while to determine the amounts of "Ngai Camphor" obtainable from the plant at various stages in its growth. For this purpose separate consignments of about ten pounds each of the leaves, collected at the commencement, middle and end of the season respectively, and of the flowers should be forwarded to the Imperial Institute for further investigation.

These samples should, if possible, be sent in hermetically closed vessels. It is possible that some of the volatile camphor may have escaped from the consignment now reported on during its transit to this country.

WYNDHAM R. DUNSTAN.

THE MOSQUITO PLANT.

Ocimum viride.

The mosquito plant has now fully developed in the Botanic Gardens in Singapore and produced its flowers. It attained the height of about five feet but hardly branched, being much taller than the other species of *Ocimum* cultivated here. The leaves are less aromatic but have a pungent taste, the flowers are small greenish white and inconspicuous. Various experiments were tried with it, three plants in a pot were kept in the verandah and the behaviour of the mosquitoes with respect to it observed. Large sprays of the plants were put in water, also in the verandah. In neither of these circumstances had it any perceptible effect on the insects. They were neither attracted nor repelled, and were just as annoying when the plant was there as when it was not. Mr. KLOSS besides trying all these experiments as well, rubbed a long chair all over with the leaves of the plant to see if that would keep the pest away. It had no more result than the other experiments. The mosquitoes in fact quite ignored the mosquito plant and took no notice of it at all.

A writer in the Madras Mail (Indian planting and Gardening November 7 p. 304) rubbed his face and hands with the juice of the leaves. This he found effectually kept the mosquitoes off, but he found next day that he had developed a rash which increased to fair sized blisters, and eventually for five days his face and hands were as if badly scalded, and he came to the conclusion that the evil was preferable to the remedy.

It thus appears that here at least the *Ocimum viride* must be relegated to the increasing class of plants, like Castor oil (Ricinus) which have obtained a reputation for killing or driving off mosquitoes, which they do not deserve.

Editor.

Rainfall for December 1903 :—

The Fort	...	...	Ins.	3-81
The Government Hill		...	,,	5-63
Pulo Jerajak	...	...	,,	2-50
Balek Pulo	...	...	,,	3-99
The Prison	...	...	,,	4-31
Lumut	...	...	,,	9-02
Pangkor	...	...	,,	9-88
Bruas	...	...	,,	10-02

M. E. SCRIVEN,

Assistant Surgeon,

Penang, 15th January, 1904. *Prison Observatory.*

MISCELLANEOUS.

Notices to Subscribers.

I. For the information of subscribers and others who have been unable to complete their series of the Agricultural Bulletin of the Straits and Federated Malay States notice is here given that Nos. 1, 7, 8, 9, of the Old Series (1891–1900) and Nos. 1, 8, 9, 10, of the New Series Vol. 1 (1901–1902), the first issues of which have long been exhausted, are now being reprinted, with plates, and will shortly be ready.

II. Subscribers whose subscriptions are still unpaid are requested to send in their subscriptions for the present year as soon as possible. Members of the United Planters Association are requested to send in their subscriptions in future directly to the Editor and not to the Secretary of the Association.

II. Subscribers outside the Peninsula will in future be charged \$3.50 per annum instead of \$3 in order to cover postage.

Meteorological Observers are asked to send in their returns to the Editor, to arrive before the 10th day of the following month if possible, so as to be in time for going to press.

Wanted Nos. 8 & 9 of Vol. 1 (N. S.) of the Bulletin to complete the volume. Address F. B. Manson, Park View, Fytche Road, Rangoon.

SINGAPORE MARKET REPORT.

December, 1903.

Articles.	Quantity sold.	Highest price.	Lowest price.
	Tons.	$	$
Coffee—Palembang	75	30.00	26.00
Bali	228	23.00	21.50
Liberian	275	22.50	22.25
Copra	1,277	9.50	7.25
Gambier	2,112	12.25	11.50
Cube Gambier, Nos. 1 & 2.	290	18.00	15.00
Gutta Percha, 1st quality	...	270.00	200.00
Medium	...	190.00	100.00
Lower	...	120.00	17.00
Borneo Rubber	...	135.00	82.00
Gutta Jelutong	...	8.25	7.10
Nutmegs, No. 110's	...	73.00	70.00
No. 80's	...	120.00	105.00
Mace, Banda	...	170.00	160.00
Amboyna	...	140.00	130.00
Pepper, Black	362	33.50	32.50
White	327	52.50	51.00
Pearl Sago, Small	90	5.90	5.40
Medium	...	...	...
Large	...	...	...
Sago Flour, No. 1	2,640	4.35	4.15
No. 2	280	1.75	1.65
Flake Tapioca, Small	715	4.90	4.65
Medium	10	4.65	
Pearl Tapioca, Small	404	4.65	4.50
Medium	507	4.70	4.50
Bullet	...	...	...
Tin	1,850	88.00	76.50

(*A*)

Exports from Singapore and Penang to Europe and America.

For fortnight ending 15th December, 1903.

Wired at 11.45 a.m. on 16th December, 1903.

		Tons Steamer.
To England.		
Tin	from Singapore & Penang to England and U. K. optional any ports. -	800
Gambier	from Singapore to London -	10
,,	,, ,, ,, Liverpool-	120
,,	,, ,, to U. K. & / or Continent -	210
,,	,, ,, to Glasgow -	...
Cube Gambier	,, ,, ,, England -	60
White Pepper	,, ,, ,, ,, -	190
Black ,,	,, ,, ,, ,, -	...
White Pepper	,, Penang ,, ,, -	...
Black ,,	,, ,, ,, ,, -	...
Pearl Sago	,, Singapore ,, ,, -	10
Sago Flour	,, ,, ,, London -	250
,, ,,	,, ,, ,, Liverpool-	1,300
,, ,,	,, ,, ,, Glasgow -	...
Tapioca, Flake	,, Singapore & Penang to England	350
,, Pearl & Bullets	,, ,, ,, ,, ,, -	210
,, Flour	,, Penang ,, ,, -	250
Gutta Percha	,, Singapore ,, ,, -	...
Buff hides	,, ,, ,, ,, -	120
Pineapples	,, ,, ,, ,, cases	3,500
To America.		
Tin	from Singapore & Penang -	800
Gambier	,, Singapore - -	220
Cube gambier	,, ,, - - -	10
Black Pepper	,, ,, - - -	70
,,	,, Penang - - -	...
White Pepper	,, Singapore - - -	...
,,	,, Penang - - -	...
Nutmegs	,, Singapore & Penang - -	...
Tapioca, Flake & Pearl	,, ,, ,, - -	340
Pineapples	,, ,, - - cases	350
To the Continent.		
Gambier	from Singapore to South Continental Ports-	170
,,	,, ,, ,, North ,, -	...
Black Pepper	,, ,, ,, South ,, -	100
,,	,, ,, ,, North ,, -	20
Black Pepper	,, Penang ,, South ,, -	20
,,	,, ,, ,, North ,, -	...

			Tons Steamer.
White Pepper	from Singapore	to South Continental Ports	...
,,	,, ,,	,, North ,,	60
,,	,, Penang	to South Continental Ports	...
,,	,, ,,	,, North ,,	20
Copra	,, Singapore & Penang	to Marseilles	440
,,	,, ,,	,, Odessa	860
,,	,, ,,	,, South Continental Ports other than Marseilles and Odessa	520
,,	,, ,,	,, North Continental Ports	1,050
Tin	,, ,,	,, Continent	390
Tapioca Flake	,, ,,	,, ,,	360
Tapioca Pearl	,, ,,	,, ,,	510
Cube gambier	,, Singapore	,, ,,	30
Pineapples	,,	,, ,,	cases 2,200
Sago Flour	,,	,, ,,	1,000

N.B.—By "South Continental Ports" are to be understood all inside and by "North Continental Ports" all outside Gibraltar.

1,500 tons Gambier
200 ,, Black Pepper
(*in Singapore*)
} contracted for during fortnight ending as above.

Telegraphed to A. A. NIBLETT, Ingram House, 165, Fenchurch Street, London, E. C.

(*B*)

Exports from Singapore and Penang to Europe and America.

For fortnight ending 31st December, 1903.

Wired at 11.15 a.m. on 1st January, 1904.

To England:—

			Tons Steamer.
Tin	from Singapore & Penang	to England and U. K. optional any ports	675
Gambier	from Singapore	to London	...
,,	,, ,,	to Liverpool	270
,,	,, ,,	to U. K. & / or Continent	120
,,	,, ,,	,, Glasgow	...
Cube Gambier	,, ,,	,, England	40
White Pepper	,, ,,	,, ,,	90
Black ,,	,, ,,	,, ,,	...
White ,,	,, Penang	,, ,,	20
Black ,,	,, ,,	,, ,,	...
Pearl Sago	,, Singapore	,, ,,	30
Sago Flour	,, ,,	,, London	140
,,	,, ,,	,, Liverpool	300
,,	,, ,,	,, Glasgow	...

		Tons Steamer.
Tapioca, Flake	from S'gapore & P'nang to England -	310
,, Pearl & Bullets	,, ,, ,, ,, ,, -	90
Tapioca Flour	,, Penang to England -	625
Gutta Percha	,, Singapore ,, ,, -	40
Buff hides	,, ,, ,, ,, -	120
Pineapples	,, ,, ,, ,, cases	26,000

To America:—

Tin	from Singapore & Penang -	330
Gambier	,, ,, sailing 100	440
Cube Gambier	,, ,, -	30
Black Pepper	,, ,, -	100
,,	,, Penang -	...
White Pepper	,, Singapore -	...
,,	,, Penang -	...
Nutmegs	,, Singapore & Penang -	5
Tapioca, Flake & Pearl	,, ,, ,, sailing 600	370
Pineapples	,, ,, ,, cases	1,250
Sago Flour	,, ,, ,, -	150

To the Continent:—

Gambier	from Singapore to South Continental Ports	100
,,	,, ,, ,, North ,, -	80
Black Pepper	,, ,, ,, South ,, -	90
,,	,, ,, ,, North ,, -	...
,,	,, Penang ,, South ,, -	...
,,	,, ,, ,, North ,, -	...
White Pepper	,, Singapore ,, South ,, -	...
,,	,, ,, ,, North ,, -	...
,,	,, Penang ,, South ,, -	...
,,	,, ,, ,, North ,, -	...
Copra	,, Singapore & Penang to Marseilles -	...
,,	,, ,, ,, Odessa -	420
,,	,, ,, ,, South Continental Ports- other than Marseilles and Odessa.	100
,,	,, ,, ,, North Continental Ports-	200
Tin	,, ,, ,, Continent -	180
Tapioca Flake	,, ,, ,, ,, -	50
Tapioca Pearl	from Singapore & Penang to Continent -	120
Cube gambier	,, Singapore ,, ,, -	20
Pineapples	,, ,, ,, ,, cases	2,000
Sago Flour	,, ,, ,, ,, -	300

N. B.—By "South Continental Ports" are to be understood all inside and by "North Continental Ports" all outside Gibraltar.

1,000 tons Gambier
160 ,, Black Pepper
(in Singapore)
} contracted for during fortnight ending as above.

Telegraphed to A. A. Niblett, Ingram House, 165, Fenchurch Street, London, E. C.

Singapore.

Abstract of Meteorological Readings for the month of December, 1903.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew point.	Humidity.			
	Ins.	°F.	°F.	°F.	°F.	°F.	°F.	Ins.	°F	%		Ins.	Ins.
Kandang Kerbau Hospital Observatory	29·868	135·9	77·8	85·1	72·5	12·6	75·0	·805	73·0	79·0	N.W. & N.E.	10·81	2·98

K. K. Hospital Observatory,
Singapore, 4th January, 1904.

A. B. LEICESTER,
Meteorological Observer.

D. K. McDOWELL
Principal Civil Medical Officer, S.S,

Penang.

Abstract of Meteorological Readings for December, 1903.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
	ins.	°F	°F	°F	°F	°F	°F	ins.	°F	%		ins.	ins.
Criminal Prison Observatory	29·881	135·5	79·3	87·6	73·9	13·7	74·8	·779	70·6	73	N.W.	4·31	1·12

Colonial Surgeon's Office,

Penang, 8th January, 1904.

M. E. SCRIVEN,

Asst. Surgeon.

T. C. MUGLISTON,

Colonial Surgeon, Penang.

Malacca.

Abstract of Meteorological Readings for December, 1903.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew point.	Humidity.			
	ins.	°F	°F	°F	°F	°F	°F	ins.	°F	%		ins.	ins.
Durian Daun Hospital.	29·834	161·5	78·9	89·7	69·8	20·1	79·3	10·34	69·8	95	N.N.W.	2·50	0·68

Colonial Surgeon's Office,
Malacca, 14th January, 1904.

F. B. CROUCHER,
Colonial Surgeon, Malacca.

Perak.

Abstract of Meteorological Readings in the various Districts of the State, for December, 1903.

Districts.	Mean Barometrical Pressure at 32° Fah.	Temperature.				Hygrometer.			Total Rainfall	Greatest rain-fall during 24 hours.
		Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean wet Bulb.	Vapour Tension.	Humidity.		
Taiping ...	...	78·70	90	70	20	75·53	·842	86	17·44	2·14
Kuala Kangsar ...	...	78·20	89	69	20	74·65	·812	84	6·68	1·82
Batu Gajah ...	...	78·51	91	70	21	75·02	·822	84	10·77	1·65
Gopeng ...	...	77·61	90	63	27	74·92	·833	88	15·04	2·28
Ipoh ...	...	78·41	90	71	19	75·65	·851	88	14·59	2·33
Kampar ...	...	...	90	70	20	...	...	...	13·86	1·65
Teluk Anson ...	...	78·78	89	71	18	75·36	·845	84	8·35	1·80
Tapah ...	..	78·91	90	68	22	75·80	·853	86	13·41	1·74
Parit Buntar ...	...	79·	89	70	19	75·70	·846	87	7.72	2·26
Bagan Serai ...	...	78·96	88	71	17	75·37	·833	84	8·97	3·10
Selama ...	...	79·44	89	71	18	76·24	·863	86	7·30	2·08

STATE SURGEON'S OFFICE,
Taiping, 13th January, 1904.

M. J. WRIGHT,
State Surgeon, Perak.

Selangor.

Abstract of Meteorological Readings in the various Districts of the State, for December, 1903.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature. Mean Dry Bulb.	Temperature. Maximum.	Temperature. Minimum.	Temperature. Range.	Hygrometer. Mean Wet Bulb.	Hygrometer. Vapour Tension.	Hygrometer. Dew Point.	Hygrometer. Humidity.	Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
General Hospital, Kuala Lumpur	29·878	143·3	78·8	88·0	68·2	19·8	75·7	·828	73·4	83	S.W.	13·60	2·40
Pudoh Goal Hospital ,, ...	...	...	...	...	...	...	...	...	...	...	...	15·39	3·15
District Hospital ,, ...	...	...	...	...	...	...	...	...	...	...	...	12·55	4·08
District Hospital Klang	...	...	...	83·3	73·9	8·4	...	...	...	...	...	11.51	2·89
,, Kuala Langat	...	...	...	82·4	70·3	12·1	...	...	...	...	...	8·67	1·50
,, Kajang	...	...	...	87·9	73·4	14·5	...	...	...	...	...	8·86	1·90
,, Kuala Selangor	...	...	...	85·0	74·8	10·2	...	...	...	...	...	9·56	1.50
,, Kuala Kubu	...	...	...	86·7	72·0	14·7	...	...	...	...	...	9·10	1·95
,, Serendah	...	...	...	88·8	75·5	13·3	...	...	...	...	...	9·82	1·60
,, Rawang	...	...	...	83·5	72·7	10·8	...	...	...	...	...	13·10	1·79
Beri-beri Hospital, Jeram	...	...	...	...	...	...	...	...	...	...	...	12·08	2·20
Ulu Gombah	...	...	...	...	...	...	...	...	...	...	...	14·74	2·25

State Surgeon's Office,
Kuala Lumpur, 19th January, 1904.

E. A. O. TRAVERS,
State Surgeon, Selangor.

Pahang.

Abstract of Meteorological Readings in the various Districts of the State, for December, 1903.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
Kuala Lipis, ...	...	...	...	...	...	...	...	...	...	...	...	...	...
Raub, ...	...	...	...	...	...	...	...	...	...	...	...	...	...
Bentong ...	...	...	...	...	...	...	...	...	...	...	...	...	...
Pekan ...	...	...	...	...	...	...	...	...	...	...	...	...	...
Kuantan ...	...	...	...	84	70	14	...	...	...	...	...	10·35	2·30
Temerloh ...	...	...	...	92	70	22	...	...	...	...	S. E.	5·49	1·40

Kuala Lipis, 31st December, 1903.

S. LUCY,
State Surgeon, Pahang.

Muar.

Abstract of Meteorological Readings for December, 1903.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew point.	Humidity.			
Lanadron Estate.	...	...	80	87	71	16	72·5	...	...	...	...	6·66	1·55

Muar, 4th January, 1904.

ROGER PEARS.

ERRATA.

Pine-apple cultivation, Part II, Page 37.

No. 2.] FEBRUARY, 1904. [VOL. III. PART I.

AGRICULTURAL BULLETIN

OF THE

STRAITS

AND

FEDERATED MALAY STATES.

EDITED BY

H. N. RIDLEY, M. A., F. L. S.,

Director of Botanic Gardens, S. S.

CONTENTS.

PLATES—PINE-APPLE CULTIVATION.

Annual Subscription—Three Dollars.
Single Copy—Fifty Cents.
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SINGAPORE:
PRINTED AT THE GOVERNMENT PRINTING OFFICE.

NOTICE.

The Scientific and Technical Departments of the Imperial Institute.

His Excellency the Governor has received a despatch from the Right Hon'ble the Secretary of State for the Colonies calling attention to the advantages offered by the Imperial Institute to Merchants, Planters and others, who may wish to have samples submitted to scientific experts for opinion as to their commercial value, &c. The following extracts from a Memorandum published by the Authorities of the Imperial Institute will give an idea of the work undertaken and carried on there.

"The Scientific and Technical Department of the Institute has "been established to acquire information by special enquiries and "by experimental research, technical trials and commercial valua-"tion regarding new or little known natural or manufactured pro-"ducts of the various Colonies and Dependencies of the British "Empire and of Foreign Countries, and also regarding known "products procurable from new sources, and local products of "manufacture which it is desired to export. This work is carried "out with a view to the creation of new openings in trade, or the "promotion of industrial developments."

2. In an extensive and well equipped series of Research Laboratories, a numerous staff of skilled chemists under the direction of Professor WYNDHAM R. DUNSTAN, M.A., F.R.S., carry out the investigation of the chemical constitution and properties of new dye-stuffs, tanning materials, seeds and food-stuffs, oils, gums and resins, fibres, timbers, medicinal plants and products, with a view to their commercial utilization. Whenever necessary these materials are submitted to special scientific experts, by whom they are made the subject of particular investigation or practical tests. Reports are also obtained from technical or trade experts in regard to the probable commercial or industrial value of any such products, while full information is collected from official or other trustworthy sources regarding the probable extent and cost of available supplies.

Reports on the results of enquiries or experimental investigations are supplied as a rule, without charge, but should special expenses be incurred in connection with any such reports, or with the commercial value of particular materials or manufactured products, which the Council do not consider themselves warranted in meeting, a statement of such outlays will be furnished, for repayment, when the Reports are supplied. Should an investigation or report of exceptional character be asked for by a Government Department, an estimate of the attendant expenses will be submitted, with a view to ascertain whether authority for such expenditure will be given.

AGRICULTURAL BULLETIN

OF THE

STRAITS

AND

FEDERATED MALAY STATES.

No. 2.] FEBRUARY, 1904. [Vol. III. Part I.

PINEAPPLE CULTIVATION.

Plates

Diseases and Pests of Pines.

The worst animal pests which destroy pines in the Straits Settlements are porcupines, musangs, and wild pigs, which are very destructive in districts where there is much forest. Insect pests are few and seldom very injurious. The worst seem to be mealybugs (*Coccidæ*) which attack the young leaves. A species of *Dactylopius*, *D. longispina* is mentioned by Mr. Tryon as doing damage in Southern Queensland, and also in New Guinea (Queensland Entomologist reprinted in Cape Agricultural Journal, Vol. XVIII, p. 549). These mealybugs attack the young leaves and base of pine and according to Mr. Tryon in dry weather descend below the ground and do more damage there. He points out that the ants often cover the base of the pine by a loose wall of vegetable debris, under which the mealybug thrives being in partial darkness. The presence of ants in quantity on a tree or plant in the tropics usually implies the existence of *Coccidæ* or *Aphides* of some kind, and may often be taken as a warning that the plant is sick. It is only when abundant that the ants take the trouble to wall in the mealybugs.

Mr. Tryon recommends the use of sulphur and limewash, first immersing the suckers in this before planting.

Mr. C. E. Smith (Jamaica Bulletin IX, p. 165) recommends the use of tobacco water—1 pound of tobacco to two gallons of water, for cleaning the suckers. In any case infected suckers should not be planted, and a little reasonable care on the Pineapple Estates should prevent any serious damage from this pest.

The West Indian mealybug appears to belong to another species *D. brevipes*.

Mites.—In the Queensland Journal of Agriculture 1898, p. 462, certain mites are described and figured, one of which *Tarsonemus ananas* is stated to make minute holes in the pines and allow of the entrance of the Care-rot fungus in Australia. The mite itself apparently does but little harm, in any other way.

The pineapple scurf-scale *Aulacaspis bromeliæ*, Kerner, is described and figured in the Cape Agricultural Journal (XVI, p. 100,) it is a greyish white scale nearly circular and flat. It has long been known in European pineries and seems to have been accidentally introduced into South Africa on a pine from Madeira. It is stated to be a very serious pest and to have destroyed pineapple cultivation in Madeira. It infests both sides of the leaf of the pineapple and is easily seen. I do not know of its occurring in the Straits, but it occurs in Africa, Europe and Hawaii.

Fruit rot.—This disease is very common here, and has been well described by Mr. TRYON (Queensland Agricultural Journal 1898, p. 458) under the name of Care-rot, a very misleading name as that part of the pine which is commonly known as the care is never affected by it. Fruit affected by this may appear to have ripened unevenly, patches on the surface remaining green while the rest of the fruit possesses the orange or red color of ripeness, but often there is nothing on the outside to show that inside there is decay. Occasionally again there is a depression or hole in the surface above the diseased portion. On cutting the pine across, it is seen that one or more of the segments, botanically one or more fruit is rotten, the placenta and walls of the ovary decayed or very often dry and withered up leaving a hole in the flesh. Usually there is more than one of these affected in a diseased pine, but the disease does not spread to the core of the fruit nor from one fruitlet to another. The disease is due to the attacks of a fungus allied to *Monilia candida* Pers. which seems to enter the fruit by some wound, such as that caused by the mite above described. In a pine thus diseased taken from a factory I found a mite very similar to that described and figured by Mr. TRYON, and also a very small species of the order *Collembola*, a very small semi-transparent white insect, which did not apparently possess the spring apparatus of most species of that order. This disease here however is said by Mr. LANDAU to be caused by a beetle. In any case it appears that whatever insect inflicts the wound the real destruction is caused by the fungus. Mr. LANDAU informs me that the disease is common in low ground but rare in the dryer hilly fields. Fruit-rot though not completely destroying the fruit, spoils it for sale purposes, and in tinning the parts decaying have to be excised. In some factories in the case of pines so diseased the fruit is preserved in the form of chunks or cubes. The decayed bits being cut out and thrown away.

Broken heart is the name given in the Straits to a somewhat similar disease which however commences under the crown of leaves at the top of the fruit. A black spot appears and increasing the decay forms a hole in the core about an inch or more deep running downwards. A gummy matter is exuded into the hollow. In the few examples of this disease I have seen, I saw no insects but it seems probable that the decay arises from some injury probably caused by an insect in the crown. It chiefly occurs in wet lands like the last disease, rarely in a dry hilly plantation. Mr. LANDAU informs me that this disease is propagated by using suckers from an infected

Photo by A. D. M

Chinese Pine-apple Factory (inside), Singapore.

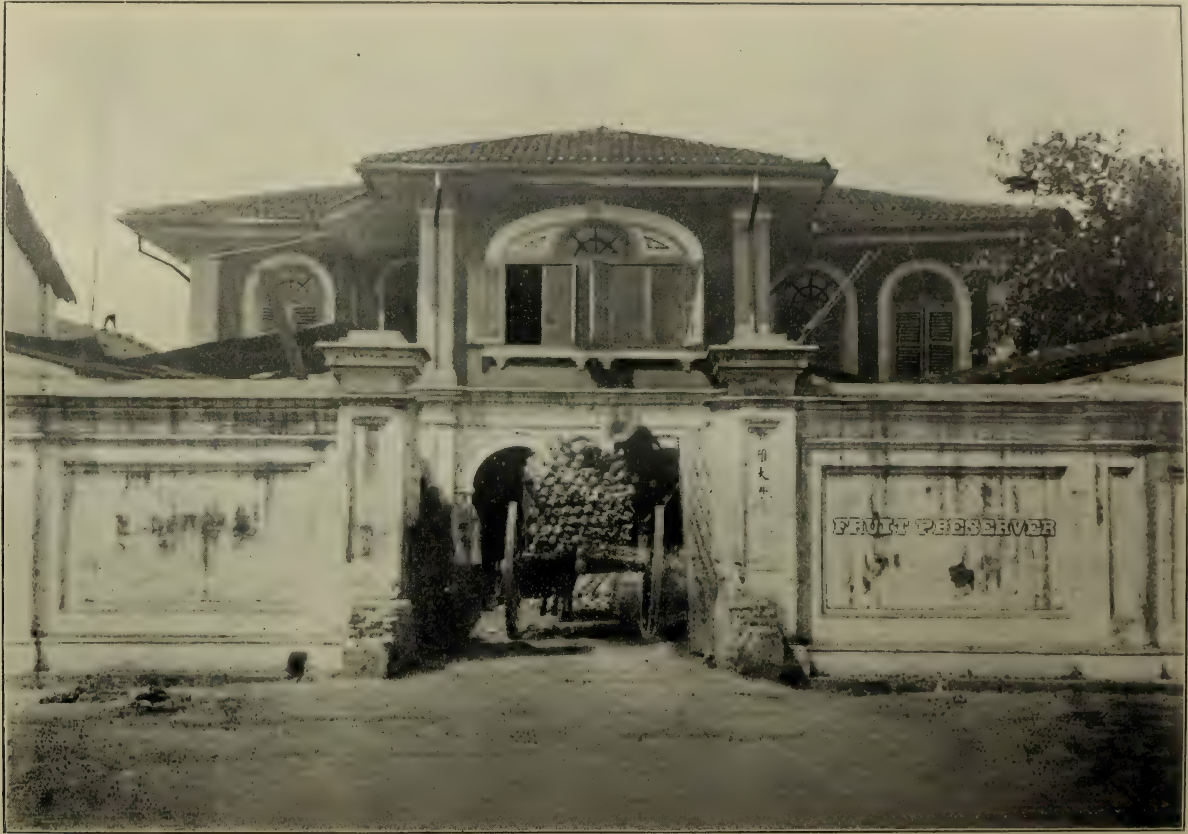

Photo by A. D. M.

Chinese Pine-apple Factory (outside), Singapore.

plant. If so it is probably due to some especial insect which infests the bases of the leaves of the crown and suckers. Infected pines can be preserved, the decayed portion of the core being removed.

Another common disease probably also due to a fungus is shown by the pine being hard and woody and in section seen to be streaked and spotted with brown or black lines and dots. This disease is said to be due to the soil and only occurs in certain fields. In this case most of the pines are infected and quite worthless and fruit known to be from a field attacked with this disease are not bought by the pine-preservers.

"Male" pines (jantan)—The Malays apply this name to pines which never develop remaining small hard and woody, but not showing any special signs of disease. They are in fact aborted. The cause of this is at present obscure.

A pine-apple disease in Natal is described by Dr. SCHONLAND in the Cape Agricultural Journal 1898, p. 293. This seems a serious disease as about half the crop of one of the planters was destroyed utterly by it. Its first appearance is shown by a drop of gum exuding from the fruit. Underneath this spot the fruit begins to decay. The decay continues through the fruit and if it is not removed goes down to the root. The attack commences when the fruit is very young, and fruits over two inches long if not previously attacked are safe. The cause of the disease is quite obscure at present, but is possibly due to some insect. If the diseased fruits are removed and destroyed the plant remains uninjured.

TINNING.

The pines are here always peeled by hand, though machines for this purpose have been invented, as it is found more economical to use hand labour here where it is cheap. The peelers are Chinese. They cut the top and bottom off the pine and peel it with a knife, holding the pine in the left hand which is covered with an india-rubber glove, to protect it from the acid action of the pine juice. The gloves have constantly to be renewed as they are soon destroyed by use. The pines are then put in the tins which are filled up with either water or syrup. The cores are removed previously if required by a tin tube which is pressed through the centre, but most pines are tinned without coring. The syrup is made of 3 catties of sugar to one picul of water. After the pine is put in the tin it is soldered up, and a number of tins are put on a kind of wooden raft and plunged in a tank of water heated by steam. They are boiled in this tank for from ten minutes in the case of the smallest tins to an hour and a half for large tins. The biggest tins weigh five pounds when full. After removal from the boiling water a puncture is made in the top of the tin with a hammer and punch, and in large tins two punctures. This is to let out the steam, and after this the holes made are re-soldered and the tins plunged again into boiling water for nine minutes. They are then labelled and packed for export.

The object of tinning without sugar is to avoid duty on sugar, and also to enable confectioners to use them for their purposes. Pineapple juice is often added in the case of pines not preserved with sugar, but the tins are often filled with plain water. Other forms of exported pines are in slices half an inch thick, (sliced pines) and with the eyes removed (eyeless pines). Bruised pines and others are often cut into chunks, or cubes. All these are tinned in the same way. Grated or jam pine is another form of export. Crystallized pines are dried in the sun, and then crystallized in sugar.

The sugar used is usually Java sugar, but Mr. LANDAU tells me he finds Austrian beet sugar better on account of its color. The cost is however about the same. One manufacturer states that he preserves all his pines in syrup about 30 degrees solution, using from 11 to 20 lbs. of sugar to a cwt. of pines.

MACHINERY.

The greater part of the machinery employed (90 per cent.) is of English manufacture. It consists of Tin plate cutting machines, Cover presses, and rolling machines, for making the tins, and boilers for the cooking of the fruit. The tins are made completely in Singapore.

REFUSE.

The waste bits, peelings etc. are used to a small extent for feeding pigs by the Chinese, and also in dyeing cloth with indigo. But for the greater part is treated as waste and dumped down in waste ground or rubbish heaps and left to decay.

MEDICINAL USES.

The juice of the young leaves is used in India as a purgative and anthelmintic. The fruit especially when unripe is used as an abortient and in Burmah and some parts of India absolutely considered poisonous.

PINEAPPLE BEVERAGES.

There have been a number of attempts to make wines or champagnes from pines, but they have not met with much success, generally speaking they do not seem to have been very popular drinks.

In 1850 the Bugismen in Singapore used to make an intoxicat, ing liquor of pineapple juice in the first stage of fermentation, but it seems to have been rather too acid, for it was found necessary to mix with it some Nireh bark (*Carapa moluccana*) to prevent its producing diarrhœa. This drink was only made before a feast day and was not preserved. It seems to have been popular with them but the manufacture has died out now (Logan's Journal III, p. 579.)

H. N. RIDLEY.

Valuation Report on Sample of Sea Island Cotton grown in Perak.

For some time past Cotton has attracted considerable attention in different parts of the Empire and the following valuation report on a sample of Sea Island Cotton grown in the Government Gardens at Kwala Kangsar, Perak, may be of interest:—

CHAMBER OF COMMERCE,
MANCHESTER,
December 5th, 1903.

Dear Sir,

"*Yours of the 30th November*

"I have obtained the report of a competent expert upon the sample of cotton referred to in your letter.

The staple or fibre is described as too short for Sea Island. It is classed, without reference to its origin, as equivalent to "Fully good Middling American" and as being worth in the market yesterday 7*d.* to $7\frac{1}{4}$*d.* per lb.

The staple is further described as "rough, coarse and very wasty." By "very wasty" the expert means that in the processes preparatory to spinning this cotton would lose an inordinate amount of fibre as waste, fit only for the spinning of low counts of yarn.

ELIJAH HELM.

To Sir W. THISELTON DYER, K. C. M. G."

This report was obtained through the assistance of Sir W. THISELTON DYER, Director of Kew, who remarks—"I have had occasion to point out previously that long staple cotton appears to be most in demand in the English market."

I would point out that the sample referred to was produced from bushes raised from locally saved seeds already old in Perak parentage, and that better results might be expected from imported seeds, or seeds from the first generation.

At the present time, even a "middling" grade cotton which gives a sufficient return to furnish a good catch crop should be an acquisition. For this purpose Sea Island Cotton is well suited, it is a perennial bush and crops several times before becoming exhausted, and would most probably last as long as required between rubber or coconuts without replanting. Under cultivation on the best soils the plant admits of ordinary treatment and little difficulty need be anticipated until a crop is ready for harvesting, when, for climatic reasons, prompt action would be necessary. It is assumed that, as a catch crop, only alluvial or rich soils would be planted and that the poonac, or better still, the manure from animals fed on poonac, would be returned to the soil for the benefit of the permanent crop.

Usually, Sea Island cotton crops in the early part of the year, commencing when 12 months old, with older bushes the crop can be somewhat regulated by pruning and lopping, thus producing 2 or 3 "flushes" in the life of the plant. I would describe Sea Island cotton as furnishing a fair crop but have not figures of actual yield.

R. DERRY.

27th January, 1904

COTTON IN DUTCH BORNEO.

A specimen of cotton grown in Borneo was recently submitted for examination to the Director of the Industrial and Commercial College at Enschede, Holland, who reported that it appeared to be equal in fineness and length of fibre to the finer qualities of Egyptian cotton. The length of the fibre was about $\frac{1}{18}$ ins., and the sample was valued at 4*s*. per pound.* It was suggested that the plant yielding this cotton should be experimentally cultivated in order to assertain the yield obtainable from it.

Enquiries made by the Governor-General of Borneo elicited the following information, which was published in the "Indische Mercuur," October, 1901.

The specimen of cotton is the product of a tree occasionally met with on the banks of the Barito River, and known to the natives as "kapas-rampit." When fully developed it attains a height of 13 ft. and a circumference of from 15 to 16 ins. According to the natives it lives about seven or eight years.

The tree does not occur in the wild state, but is occasionally cultivated as a curiosity by the natives. Formerly, when each native household wove its own cotton, the annual variety of cotton was frequently planted, but the product of this is inferior, the fibre being much shorter than that of "Kapas-rampit", and its cultivation has, therefore, been abandoned.

Although the "Kapas-rampit" grows vigorously in several districts of Borneo, its systematic cultivation has not so far been attempted. No information could be obtained concerning the yield of cotton, but trees were noticed, which were covered with flowers or were quite white with the ripe pods.

The flowers are of a yellowish-white colour: the pods are cylindrical in shape, and trilocular, each division containing about eight seeds.

It is possible that this species of Gossypium is not indigenous to Borneo, although it bears a native name, but may have been introduced by the early Dutch trading companies.

The tree grows readily in an argillaceous soil containing a little sand, and is not adversely affected by excess of moisture, which is an important consideration in Borneo, where the climate is humid.

* Possibly a misprint. The price is abnormal—*Editor.*

Specimen of the leaves and pods sent to Holland were found to somewhat resemble those of "Kapas-borsaar" (*Gossypium vitifolium*), a species cultivated in Java.

Four or five years ago, large plantations of a variety of "Kapas-rampit" were made near Singapore, but were not profitable, since the cotton fibre produced was brittle, and could not be spun. The variety cultivated at Singapore, however, appears to have been different from the found in Borneo.

The experimental cultivation of the plant has recently been commenced at Boentok.

Supplement to the Board of Trade Journal July 9, 1903, p. 90

Correspondence with the Imperial Institute regarding the commercial value, &c., of the Seeds of the Para Rubber Tree.

STRAITS.

[No. 404.] DOWNING STREET,

2nd December, 1903.

Sir,—I have the honour to transmit to you, for your information, the paper noted in the subjoined schedule.

I have, &c.,

ALFRED LYTTELTON.

The Officer Administering the Government of the Straits Settlements.

Date.	From.	To.	Subject.
1903			
23rd November.	The Imperial Institute.	The Colonial Office.	Seeds of the Para Rubber Tree.

553/10

IMPERIAL INSTITUTE OF THE UNITED KINGDOM, THE COLONIES AND INDIA, IMPERIAL INSTITUTE ROAD,

London S. W., 23rd November, 1903.

SIR,—I have the honour to enclose a report on the possible commercial uses of the seeds of *Hevea brasiliensis* (the Para Rubber tree) which has been made at the instance of the Government of the Straits Settlements, and to ask that you will be good enough to transmit this to the Government at Singapore.

It will be seen that important commercial uses are indicated for these seeds which are at present a waste product.

I trust that the further action suggested in the Report may be taken to put the seeds on the English market. The Imperial Institute is taking steps to bring them under the notice of brokers and merchants, and will be glad to be of any further assistance to the Government of the Straits Settlements in the matter.

I am, &c.,

WYNDHAM R. DUNSTAN,

Director.

The Under Secretary of State, Colonial Office.

IMPERIAL INSTITUTE.

(SOUTH KENSINGTON, LONDON, S. W.)

Report on the Constituents of the Seeds of *Hevea Brasiliensis* and their Commercial uses by Professar Wyndham R. Dunstan, M. A., F. R. S., Director.

A consignment of the seed of the Para Rubber tree (*Hevea Brasiliensis*) was forwarded to the Imperial Institute by the Assistant Superintendent of Forests and Gardens, Penang, at the request of the Superintendent of Government Plantations, Selangor, and is referred to in a letter dated 16th October, 1902.

A sample of *decorticated* Para rubber seeds was subsequently sent to the Imperial Institute by Mr. L. WRAY, Curator of the Perak Museum, Straits Settlements, together with a covering letter dated 15th February, 1903, and a third sample, consisting of meal prepared from these seeds by a local planter, was forwarded to the Imperial Institute by the Acting Superintendent of Forests and Gardens, Penang, together with a letter dated 17th April, 1903.

In the letters accompanying these samples it was stated that large areas in the Straits Settlements and the Malay Native States have now been planted with *Hevea brasiliensis*, and that in a few years large supplies of this seed will be available. It was therefore considered desirable that the seed should be examined in order to determine its commercial value and to ascertain especially to what purposes the oil and meal prepared from it could be applied. It is suggested in the letter dated 16th October, 1902, that the oil might be used in the preparation of varnish and that the residue might be used as a cattle food.

CHEMICAL EXAMINATION OF SEEDS.

These samples have been submitted to chemical examination in the Scientific and Technical Department of the Imperial Institute with the following results:—

The kernels constitute about 50 per cent. by weight of the whole seeds. On extraction with light petroleum, they yielded 42.3 per

cent. of oil (specimen A) whilst the whole seed (husk and kernel ground together) furnished 20 per cent. of oil (Specimen B).

The oil obtained from the kernels alone is clear, of a light yellow colour, and has an odour somewhat resembling that of linseed oil. It belongs to the class of drying oils and yields a clear, *transparent* film, when allowed to dry by exposure to air. The husks contain a solid fat, which has a high saponification number and a low iodine value, but since the amount of this solid fat in the husks is very small it makes but little difference to the properties of the oil obtained from kernel and husks ground together. The following table gives the constants found for both specimens of the oil, those of linseed oil being added for comparison.

	Para Rubber seed oil A (from kernels only.)	*Para Rubber seed oil B (from whole seed.)*	*Linseed Oil.*
	—	—	—
Specific gravity at 15° C	0.9302	0.9316	0.931 to 0.937
Free Fatty Acids			
Acid Value	10.7	19.0	0.8 to 8.9
(Calculated as Oleic Acid)	5.4 per cent.	9.6 per cent.	0.4-5.7 per cent.
Ester value	195.4	190.3	
Neutral Oil	94.6 per cent.	90.4 per cent.	95.5-99.6 per cent.
Saponification value	206.1	209.3	187-195
Iodine value	128.3	121 2	160-181

On saponification with Caustic Soda, Para Rubber seed oil yields a rather soft soap of a yellowish colour. It was found that the time required for the complete saponification of this oil is about half as much again as that required in the case of olive oil.

Examination of Para Rubber Seed Meal.

The sample consisted of about seven pounds of finely ground meal of a pale buff colour; it was free from husk and possessed the pleasant odour characteristic of oil meals. The results of its chemical examination in the Scientific and Technical Department of the Imperial Institute are as follows:—

Extraction and Examination of the Oil.

On extraction with light petroleum, the meal yielded 36.1 per cent. of an oil which had a slightly acid odour, and, on standing solidified as a soft crystalline, yellow mass. It furnished the following constants:

Specific gravity at 1.5° C	0.911
(Acid Value)	130.5
Free Fatty Acids (Free Acids calculated as oleic acid)	65.6 per cent.
Neutral Oil	34.4
Ester Value	65.2
Saponification Value	195.7
Iodine Value	136.2

When heated, the oil began to melt at 19° C. and was a clear liquid at 28° C. It had very marked drying properties and yielded a solid, transparent film. On saponification with caustic soda, the oil furnished a rather soft soap of a yellowish colour.

In the following table, the constants and properties of the oil extracted from this sample of meal are contrasted with those of the oil obtained from the freshly crushed decorticated seeds; the constants of linseed oil are again added for comparison.

	Oil extracted from Para Rubber seed meal.	*Oil extracted from decorticated Para Rubber seeds (freshly crushed.)*	*Linseed Oil.*
Yield of Oil per cent.	36 1	42.3	33-37
Physical state	Solid below 19° C	Liquid	Liquid
Specific gravity 15°/15°	0.911	0.9302	0.931-0.937
Free fatty acids per cent. (calculated as oleic acid)	65.6	5.4	0.4-5.7
Iodine value	136.2	128.3	160-181

It will be observed that the oil extracted from the meal was solid whereas that obtained from the freshly ground seed was a liquid. This difference is due to the large proportion (65.6 per cent.) of free fatty acids present in the former, whilst the latter contained only 5.4 per cent. of free acids. The cause of this difference in the two oils has been investigated and it has been found that after the seed has been crushed the oil gradually undergoes decomposition, owing to the action of a Hydrolytic enzyme contained in the seed which will be made the subject of special study.

Analysis of the Meal.

The meal furnished the following results on analysis:—

Moisture	...	...	9.1 per cent
Ash ...	...	...	3.53 ,,
Fibre ...	...	...	3.4 ,,
Oil ...	...	...	36.1 ,,
Proteids	...	...	18.2 ,,
Carbohydrates	...	...	29.67 ,,

The ash was found to contain 30.3 per cent. of phosphoric acid (calculated as P. 2 O. 5) present in the form of phosphates, which is equivalent to 1.07 per cent. of phosphoric acid in the meal.

The results of this examination of the Para Rubber seed meal indicate that the material thus prepared could neither be used as a fodder owing to the presence in it of large quantities of free fatty acids nor for the expression of Para Rubber seed oil since the latter

has been largely decomposed. It is probable however, that if the oil were expressed from the decorticated seeds, the residual cake could be utilized as a feeding material, as is shown by the following comparison between the calculated composition of such a cake and the composition of some commercial feeding cakes :—

Calculated composition of :—	Moisture per cent.	Ash per cent.	Proteids per cent.	Fibre per cent.	Fat per cent.	Carbohydrates per cent.	Nutrient value.
Para rubber seed cake	13.36	5.19	26.8	5.00	6.00	43.64	84.25
Linseed cake (new process)	9.4	5.4	35.6	7.1	7.5	35.0	87.85
Linseed cake (old process)	10.8	5.0	28.6	6.7	10.6	38.3	91.28
Cottonseed cake (new process)	11.12	6.10	38.47	9.78	8.78	25.75	84.4

These figures shew that a cake prepared from the Para rubber seed meal would compare favourably with other cakes as a cattle food, and that it contains a particularly low proportion of indigestible matter (fibre).

Commercial valuation.

Specimens of both the seeds and oil have been submitted to leading brokers. They report that the oil could probably be used as a substitute for linseed oil and would be worth at present about £20 per ton, but that oil merchants would not take it up unless they first had an opportunity of testing it in bulk. The brokers consider that it would be more profitable to ship the seeds themselves to this country, as is done in the case of most other oil seeds. They value the *decorticated* seeds at £10 to £12 per ton, and add that they would be prepared to take two or three tons at the lower price in order to introduce them into the market.

The para rubber seed meal was not commercially valued, since in its present condition it could not be utilized in any way. It may be stated however that a Para rubber seed cake of the composition already given should be almost as valuable as linseed cake, which at present sells from £5.15 to £6.15 per ton.

The results of this investigation lead to the conclusion that the seed of the Para rubber tree is a valuable economic produce and is likely to become of considerable commercial importance. The oil could probably be employed for the purposes to which linseed oil is applied, whilst the residual cake would be of value as a cattle food. It must be pointed out however that the oil should be expressed from the kernels before these have been ground, and for this reason the seeds should if possible be decorticated and the kernels exported unground.

WYNDHAM R. DUNSTAN.

21st November, 1903.

Note on the above.

Of unhusked fresh seed large and small mixed, 100 weighed a pound. When the husk was removed the kernels weighed 10½ ounces, so that it would require 341,308 seeds to make a ton. This would be produced by about five acres of rubber trees in full bearing. A man could gather say 50,000 a day, and including expenses, there ought to be a profit of 15 dollars an acre on the seed. As there are facilities in Singapore for preparing the oil and cake, it would save a good deal of expense in freight and charges to manufacture the oil here, and this would also save deterioration by drying.

Editor.

RAMBONG RUBBER.

Professor WYNDHAM R. DUNSTAN, writes from the Imperial Institute as follows on a sample of Rambong rubber and an accompanying letter:—"With reference to your query regarding the Ficus rubber, its lower price compared with Para is chiefly due to the much larger percentage of resin which it usually contains and also to the fact that the physical characters of the rubber itself are not quite so good. Improvements might be effected in both these directions by better methods of collection and preparation, and it will be well to continue experiments with these objects in view. The amount of resin present in the rubber may depend to some extent on the age of the trees diminishing with age as is known, to be the case in other rubber trees and in any case it might be possible to eliminate some of the resin by a suitable method of coagulating the latex. This of course will have to be determined by experiments. The sample of Ficus rubber sent by Mr. CALLOWAY was much superior to any other specimens of this rubber recived at the Imperial Institute and it therefore appears probable that a considerable improvement in the quality of the rubber could be effected by the application of proper methods. If so the price would be correspondingly increased.

GETAH (GETAH JELUTONG) FROM SARAWAK.

This specimen of Getah Jelutong and samples of a mineral substance used in its preparation were forwarded from Sarawak, through His Majesty's Consul at Brunei, for examination in the Scientific and Technical Department of the Imperial Institute, and are described in despatches, copies of which were transmitted to the Imperial Institute by the Foreign Office.

From the correspondence accompanying the samples it appears that the mineral substance used in the preparation of the Getah or Gutta is obtained from China, and is known to the Malays as "Menang Sayla," and to the Chinese as "Chio Koh." This substance is not employed in its natural condition, but is baked before use, being reduced thereby to a kind of feathery powder, and its

addition is said to be essential to the preparation process. The latter is described as follows:—

"It (the Getah) is taken from the Jelutong tree, and is obtained by barking the tree and then scraping off the gum as it exudes, and not by tapping, a process which is very destructive to the trees. The Getah must be prepared immediately, and this is done by first sprinkling a pint of kerosene oil in a tub, then a kerosene tin full of water is poured in and the same quantity of the gum, to which is added a teaspoonful of the "Menang Sayla," and the whole is then well mixed and afterwards kneaded and rolled into large balls, in which form it is exported." The whole value of the product is about $5 per picul, and in Singapore it is from 7 to 8 dollars per picul.

Getah Jelutong is already well known in the European and American markets under the name of Pontianac, but its commercial utilisation is chiefly confined to the United States, which imports large quantities annually. The supply is obtained from Borneo and the Malay Peninsula, and is not restricted to Sarawak as the Consul appears to indicate.

The specimen of the Getah Jelutong was a large cheese-shaped mass, of light brown colour externally, but quite white and of granular structure within; it was almost free from dirt or vegetable debris, but contained a considerable quantity of water, which exuded on pressure, and it had a distinct odour of kerosene; it was soft, could be easily worked in the fingers, and possessed very little tenacity. On exposing a piece to the air for some time, however, the outer portion hardened and became quite friable. When treated with hot water it formed a very soft mass, without becoming sticky, and could readily be moulded, but it did not harden on cooling, merely returning to its original form.

On chemical examination the material was found to contain:—

Moisture	...	...	40.8 per cent.
Ash	...	...	28 ,,

The dry material was entirely soluble in cold ether, but only partially soluble in alcohol. It did not contain any of the hydrocarbon "Gutta," the characteristic constituent of true gutta percha, but the following substances were isolated from it:—

1. A small quantity of a sticky elastic substance, resembling caoutchouc in appearance and properties;

2. A large quantity of a white granular substance;

3. A very small quantity of a distinctly crystalline substance; the two latter substances being dissolved by hot alcohol.

A comparative examination of a sample of commercial Pontianac gave almost identical results.

In appearance the Gutta Jelutong resembles a poor quality Gutta of Gutta percha, but its composition, as indicated above, would suggest that it may perhaps be more closely allied to the inferior varieties of rubber.

Getah Jelutong or Pontianac, is usually stated to be obtained from *Dyera costulata*, a large tree which is fairly common throughout the Malayan region, but it is probable that the material as met with in commerce is a mixture of guttas derived from different sources. It has been stated, in fact, that it is the custom of the natives to mix the latex of the Jelutong tree with that derived from different species of *Willoughbeia*, which yield inferior rubbers. The value of Pontianac in the London market is about $19 to $20 per ton, but as already stated, the chief demand for the material is in the United States, which in 1901 imported 9,371,037 lbs., valued at $248,838. Of this total, 8,708,107 lbs. are returned as coming from the British East Indies, probably through Singapore, whilst the remainder, 662,980 lbs., was imported from the United Kingdom. After undergoing certain treatment, the Pontianac is chiefly employed in the United States as an ingredient in the mixtures used for the manufacture of rubber goods of low quality, and its utilisation for such purposes appears to be extending.

The sample of Getah Jelutong from Sarawak was almost identical in appearance, composition and properties with commercial samples of Pontianac, being remarkably free from admixture with vegetable or mineral impurities, and it would, no doubt, be suitable for any purpose for which the latter is employed. At present, however, the material is of relatively small commercial value.

Two specimens of the mineral substance used in the preparation of Getah Jelutong were supplied: one of the mineral as imported, the other of the material prepared for use by heating. The mineral proved to be a specimen of the fibrous variety of gypsum, known as "satin spar" (hydrated calcium sulphate); it was white, translucent, crystalline and massive.

The specimen which had been heated was white and opaque; it was non-crystalline, but retained the fibrous form of the mineral, and readily crumbled to powder in the fingers. It absorbed water, but did not set like plaster of Paris. It contained only 2.48 per cent. of water, so that in course of preparation the gypsum has probably been heated to a high temperature, with the result that the product does not set when mixed with water.

If, as is indicated, the addition of this substance is essential in the preparation of the gutta, it is probably due to the fact that the latex is coagulated by a solution of calcium sulphate, as is known to be the case with several other rubber latices.

Supplement to the Board of Trade Journal. July 9, 1903, p. 65.

Recent Publications on Rubber and its Cultivation.

In the E'tudes Coloniales for October 1903, Mr. OCTAVE J. A. COLLET publishes an interesting and well illustrated paper on "L. Hevea Asiatique," based on his experiences in the Malay Peninsula, and well illustrated. He points out that at the end of

1902 there were about 3 millions of Para rubber trees planted in the Malay Peninsula, and calculates that the number of trees being exploited in Amazonas would be about 7,500,000 and while those of the Malay Peninsula cover an area of 7,000 hectares those of Amazonas are spread over 750,000 and draws attention to the advantages possessed by the British Colony in the far greater accessibility of the estates, the sufficiency of labour, the lowness of export duty as compared with those of the South American continent. The rapid growth of the trees in the Peninsula as compared with that of other places especially South America attracts his attention. The average girth of 4 year old trees at Batnapura is 55 centimetres, those of Ceylon 38 to 40, measured a metre from the ground. Those of the Malay Peninsula average 40 to 45 centimetres at from 3 to 3½ years of age, and 52 to 60 centimetres at 5 years, and quotes M. CIBOT (Journal d'Agriculture Tropicale) who says that in Amazonas we do not believe that a tree can attain a diameter of 20 centimetres in less than 15 years. So that the growth is twice as rapid in the Malay Peninsula as in the native country of the plant. After an account of the methods of raising young plants he proceeds to a discussion as to the distances of planting out, and gives some instructive measurements. A group of trees planted 24 feet by 24, *i.e.* 225 trees to the hectare gave in circumference a total of 124 m. 22; or about 55 centimetres a tree. A group of the same age planted 14 by 14, 560 trees to the hectare, gave a total of 264 m. 90, per hectare, or about 84 centimetres per tree. Thus though the difference of dimensions of the trees is not great, the closely planted trees give an area of exploitable bark of nearly double the amount, which is strongly in favour of close planting. The tapping of the trees forms the next subject of discussion and the details and calculations are mostly based on the experiments made in the Botanic Gardens, Singapore, by Mr. MACHADO and myself and those of Mr. ARDEN, and of Mr. WILLIS in Ceylon.

Para Rubber collecting at Soebang, Java.

BY H. C. DINET.

A resumé of Mr. DINET'S paper on this plantation which appeared in Teysmannia 1903, No. 8, published in the Revue des Cultures Coloniales 1903, p. 308, from which I take the following notes, as it is interesting to compare the results of tapping in Java with those of the Malay Peninsula. At Soebang there are 147 trees which were planted in 1889-1890, as shade trees for Coffee. The trees are finer than at Buitenzorg, and are at an elevation of 500 feet above sea level. They are tapped in the beginning of April when the weather is successively rainy and fine and the latex flows better than in the dry season. The author notes that the flow is most abundant in the early morning up to 9 o'clock, and attributes this to the heat and wind delaying the flow, suggesting that it would increase at higher elevations, and that if the trees were shaded so that heat and wind would not so easily have access the trees would feel their ef-

fects less. (This however one may be permitted to doubt). He considers that 1 metre 50 c. is as high as it is necessary to go in tapping. The system adopted is to make vertical incisions 20 centimetres apart with lateral cuts 10 centimetres long on one side. The following year the lateral cuts are to be made on the other side of the vertical groove, on the third year between the cuts on the first side and on the fourth between those made in the second year, (apparently the vertical groove is thus to be kept open for four years, which would certainly be liable to injure the tree). The incisions are renewed every second day by a slice off the lower edge. This is done ten times, so that the tapping takes 20 days according to the skill of the worker a man can tap from 6 to 10 trees. The renewal of the cuts more than 10 times has not succeeded at Soebang though at Buitenzorg they have been able to do it for fifteen times and get a bigger return after the tenth time. The biggest flow comes after the 6th reopening of the cut. The preparation of the rubber is effected by a modification of the well-known Amazons method, with a paddle-shaped instrument coated with clay, and the lumps of rubber so formed take 2 or 3 weeks to dry. The 147 trees supplied with ten reopenings of the wound a total of 52 kg. 5 (114 lbs. 75 grains) of dry smoked rubber, and 17.9 (37 lbs. 135 grains) of scrap; altogether 151 lbs. Eighty-two of the trees were recut 15 times but the results of the last five tappings were very small 9 kg. of rubber and scrap.

The cost of tapping and preparation of 78 kg. 4 of the rubber was 58 Guilders, or roughly 37 cents a pound.

(The value of the rubber is not stated, but from the method of preparation it was probably of inferior quality, and the amount obtained from each tree a little over a pound is smaller than it should be. The tapping system also leaves much to be desired, but it seems that these trees under proper treatment might give a return equal to that of those of the Malay Peninsula.)

Editor.

CAPRINIA CONCHYLALIS.

ROYAL BOTANIC GARDENS,
PERADENIYA CEYLON,
20th December, 1903.

H. N. RIDLEY ESQ.,
Director of Botanic Gardens, Singapore.

Dear Sir,—I have just seen your note, in the Straits agricultural Bulletin for November, 1903, on *Caprinia Conchylalis* as a pest of the Kicksia Rubber (*Funtumia elastica*).

It may interest you to know that this same insect is very troublesome in Ceylon. It completely defoliates our Kicksia plants, twice during the year, each attack extending over two or three months, *viz*: May to July and November to December. Not only are the

leaves entirely consumed, but the ends of the young shoots are eaten back for several inches. This regular periodical defoliation very seriously checks the growth of the plants, and would interfere with the profitable cultivation of this species of rubber in Ceylon. Fortunately it does not attack Para rubber which so far has proved practically immune to insect attack.

Though it would be possible to check the pest on young trees over a small area, by spraying with arsenical compounds, such treatment would be impracticable with extensive cultivation and older trees.

The same insect similarly defoliates *Portlandia grandiflora* in our Botanic Gardens.

Yours faithfully,

E. ERNEST GREEN,

Government Entomologist

ENCOURAGEMENT OF AGRICULTURE AMONG THE NATIVES.

PAPERS IN CONTINUATION OF PRINTED PAPER "EXPERIMENTAL PLANTATIONS" OF THE 19TH SEPTEMBER, 1903, NO. 104/03.

OFFICE OF THE INSPECTOR OF COCONUT TREES,

No. I.C.T., F.M.S. 174/03. Federated Malay States,

No. Misc. 7259/03. Kuala Lumpur, *11th November, 1903.*

SUBJECT:

ENCOURAGEMENT OF AGRICULTURE AMONG NATIVES.

Sir,—

I have the honour to acknowledge the receipt of your letter No Misc. 7259/03, dated 7th November current, enclosing copy of a letter by the Superintendent of the Government Experimental Plantations on the above subject for my views and recommendations.

2. The scheme proposed by Mr. ARDEN is, I believe, well worthy of consideration, but in my opinion its success entirely depends in educating the native inhabitants in the underlying principles of tropical agriculture, and until good progress in this can be fully assured it appears to me the Government would not be justified in adopting the other more extensive proposals that are suggested.

3. I regret I cannot from the experience I have had put away from any mind the fact that unless the native inhabitants are properly aroused they will never take much real interest in agriculture, more especially when the latest methods should be adopted if the best results are to be obtained, and to be taught the work on this scale, supervision will certainly have to be exercised to which exception may also be taken by them.

4. If, as suggested, the Government are to provide factories and machinery for dealing with their various produce, then the Government must feel sure the cultivators can supply regular and sufficient quantities to enable such establishments to maintain themselves, and I have the gravest doubts as to such being the case unless the land is cultivated and kept up at a high standard.

5. The question then naturally arises can any inducement be offered by Government to attract the native inhabitants and make it worth their while to take up tracts of land and really cultivate them by the best methods.

6. I am of opinion that it is possible, though of course at some cost to Government, but this need not, seeing the many advantages that may afterwards accrue, be necessarily taken into serious account.

7. My suggestions are these—*viz.*

1st. The land for a certain period of years would be given at a very low or nominal rent;

2nd. All the plants and seeds required for the various cultivation be supplied by Government to the natives free of cost;

3rd. All the heavier drainage be paid for by the Government;

4th. The market price of their produce guaranteed them by the Government.

As against this the natives would be liable to supervision and be obliged to keep the lands thoroughly cultivated.

8. Such a scheme might be started on a comparatively small scale and increased and developed if the results prove satisfactory.

9. My whole contention is that until Government is fully satisfied that the native inhabitants will really take a true interest in the proper cultivation of the land, which they might be induced to do by giving them exceptionally favourable and easy terms (and this, I consider, is well worthy of trial), it would not be of any advantage to Government to afford the financial assistance that the proposals of Mr. ARDEN might require; on the other hand, if good proof is forthcoming that the native inhabitants would fulfil their part of the bargain *re* culture, then I believe the suggestions advocated might be carried into effect with good profitable results to all concerned.

I have, etc.,

L. C. BROWN,

Inspector of Coconut Trees, F.M.S.

THE RESIDENT-GENERAL, F.M.S.

OFFICE OF CONSERVATOR OF FORESTS,
F.M.S. and S.S.

1160-40/1903. Kuala Lumpur, *16th November, 1903.*

Re ENCOURAGEMENT OF AGRICULTURE AMONG NATIVES.

SIR,—

With reference to your Misc. 7259/1903, forwarding a printed copy of a letter from the Supt., Government Experimental Plantations, on the subject of encouragement of agriculture among natives and asking for my views and recommendations thereon, I have the honour to inform you that, as you are aware, my knowledge of the Malay is necessarily very limited. Although I think there is some truth in the opinion expressed in para. 7 of the letter, still I believe that were the Malay agriculturist more energetic he would find a ready market for many articles that he could grow with ease—such as fruit, padi. I have myself seen many places all over the Federated Malay States which appear to me ideal places for padi cultivation still covered with jungle or bluker. Were compulsory measures possible I should personally advocate them, as from what I have read their effects are most advantageous in Java. This, I presume, is not contemplated and therefore beyond the point.

2. I think that, at any rate, in Perak, there is another reason for the backwardness in agriculture shown by Malays. I have been informed that they take up land as a speculation and let it out or sell it to Chinese. In this I may be wrong, but I have heard that many Malays live in this fashion without doing any work.

3. I think that much might be done by making more stringent conditions when alienating land to Malays. The occupation should be permanent and penalties should be exacted for non-fulfilment of condition of the grant. I venture to think that Malays are treated too leniently, and, in fact, are somewhat over-fostered, and that if left more to work on their own responsibility they would find that they must work.

4. As regards para. 4 of Mr. S. ARDEN'S report it would be interesting to know if the Malay-worked coffee estates were kept in good order. I have never heard that they were.

5. As to proposals in para. 5 (2), I do not think anyone would be found willing to take up such an enterprise, as he has no certainty of getting any crop of any sort, this depending entirely on whether the Malays choose to take the trouble to supply the same.

6. The scheme in itself, I think, is good, but I think that the feeling of Malays in the matter would have to be very accurately gauged before Government committed itself to lend support or financial aid. The letter, I think, is one deserving of attention and

circulation among officers who have a knowledge of the country and native character.

I have, etc.,

A. M. BURN-MURDOCH,

Conservator of Forests, F.M.S. and S S.

THE RESIDENT-GENERAL, F.M.S.

BRITISH RESIDENT'S OFFICE,

No. R-G. 4967/03 Negri Sembilan, Federated Malay States,

Seremban, *17th November, 1903.*

SUBJECT:

ENCOURAGEMENT OF AGRICULTURE AMONG THE NATIVES.

SIR,—

I have the honour to acknowledge receipt of your letter No. 7259/03 of the 7th instant, forwarding a letter by the Superintendent, Government Experimental Plantations, on the subject of the encouragement of agriculture among natives.

2. I am of opinion that the introduction of such a scheme as Mr. ARDEN suggests would be of great benefit, but fear that it would be very difficult to ensure a sufficient supply of any product to render the scheme self-supporting.

3. The hesitation of natives to follow advice tendered to them by Government officers in regard to cultivation, and probably their reluctance even to cultivate rubber at present, is due to the losses they incurred some years ago by cultivating coffee at the instance of Government.

4. I am afraid it is too late now to take any action in regard to coffee cultivation, otherwise arrangements might be made with the Port Dickson Coffee Curing Company to buy by the pikul cherry collected in small quantities by Government.

5. The difficulty of finding a market for small quantities of produce will disappear with the development of the States. I might instance that in Malacca the roots they grow on their small allotments are readily sold by Malays to competing tapioca planters; while the owners of dusuns at Labu now find a market in Kuala Lumpur for the duriens they export by rail.

I have, etc.,

W. EGERTON,

THE RESIDENT-GENERAL, F.M.S. *British Resident.*

BRITISH RESIDENCY,

No. 2304/1903. Pahang, *20th November, 1903.*

SUBJECT:

ENCOURAGEMENT OF AGRICULTURE AMONG NATIVES.

SIR,—

I have the honour to acknowledge the receipt of your letter No. 7259, on the subject of the encouragement of agriculture among natives.

2. I am of opinion that the scheme suggested by the Superintendent, Experimental Gardens, would, if well carried out, greatly promote the improvement and extension of agriculture. Its success would, however, depend almost entirely on the personality of the officer who was entrusted with the duty of bringing it into operation, and I recommend that no action be taken in the matter until the post of Director of Agriculture has been filled and the Agricultural Advisory Board been established.

I have, etc.,

WARREN D. BARNES,

Acting British Resident, Pahang.

THE RESIDENT-GENERAL, F.M.S.

BRITISH RESIDENCY,

R.-G.O. 7390/03 Perak, Taiping, *23rd November, 1903.*

SUBJECT:

ENCOURAGEMENT OF AGRICULTURE AMONG NATIVES.

SIR,—

In reply to your letter No. 7259/03, of the 7th of November, 1903, in which you invite an expression of my opinion upon the views of the Superintendent of Experimental Plantations on the subject of the encouragement of agriculture among natives, I have the honour to offer the following remarks.

2. Mr. ARDEN'S proposals are based upon the assumption that the principal obstacle to the extension of native agriculture is the difficulty experienced in the preparation and disposition of produce. That is a conclusion with which I am unable to agree. I do not think that the mind of the Malay padi planter, the Javanese gardener or the Chinese vegetable grower has ever been troubled either by the condition in which his produce is put upon the market, or by a desire to dispose of it to better advantage. The only market which he thinks about is that which lies immediately at his door. If he finds that there is a profit worth making in growing produce for that market, he will do so, but whenever he finds that he can make more money at something else he will abandon his cultivation.

3. As I have had occasion to point out on more than one occasion, the real cause of the backward condition of native agriculture

in so many parts of the Federated Malay States is simply the fact that money is to be made more easily, more quickly and more congenially by following other employments, and so long as that continues to be the case, no well-meant suggestions such as that now under consideration will attract the ryot away from the better-paid business.

4. I cannot therefore give my support to the proposals made to you, because I believe that to lay out money in the manner indicated would be to throw it away. I am reminded that an effort which was made some six years ago to establish rice mills in Krian failed because of the want of interest in the project shown by those concerned with the growth of the product.

I have, etc.,

H. CONWAY BELFIELD,

Acting British Resident, Perak.

THE RESIDENT-GENERAL, F.M.S.

OFFICE OF THE PROTECTOR OF LABOUR, F.M.S.,

No. P.O.L. 557/1903. Seremban, *12th December, 1903.*

SUBJECT:

ENCOURAGEMENT OF AGRICULTURE AMONG NATIVES.

SIR,—

With reference to your letter No. 7259/03, dated 7th ultimo, on the subject of encouragement of agriculture among natives, I have the honour to state that the paper prepared by Mr. STANLEY ARDEN appears very reasonable and I am of opinion much benefit may be derived by following the suggestions.

2. In support, I mention Arachis Hypogoea, ground nuts (six months' cropping). The results in Southern India, on old soil that no one would look at here, with an uncertain rainfall and a very small production per acre, are satisfactory to the ryot, very satisfactory to the merchant (one firm, I know, cleared £6,000 last year in the article), satisfactory to the shipper, for you see steamers waiting on the coast to fill up with 10,000 to 40,000 bags, satisfactory to the Government as arrears of the Government taxes, etc., in the districts where the article is grown are almost unknown.

They are said to grow the crop on the land again and again and then it gives better crops of grain. The land is ploughed frequently.

3. I have not had time to justify the expression of more than an opinion that I must qualify as superficial.

4. The facts that Mr. STANLEY ARDEN states are familiar to me, and I agree with what he says in para. 8: three acres at three cents, at $15=$135, for a man and his family living in their own house; but most of the native coffee gardens changed hands at such

rates per acre by the help of chetties that the people were unable to pay interest and this broke up their homes.

I have, etc.,

T. H. HILL,

Protector of Labour, F.M.S

P.S.—Since writing foregoing, by your instructions I went ove the gardens under Mr. STANLEY ARDEN'S charge. I formed a high opinion of his developed capacity and look upon him as a valuable servant to the Government and am prepared to back this expression of opinion by a report should you desire it.

T. H. H.

THE RESIDENT-GENERAL, F.M.S.

BRITISH RESIDENCY,

No. 6344/1903. Selangor, *18th December, 1903.*

ENCOURAGEMENT OF AGRICULTURE AMONG NATIVES.

SIR,—

I have the honour to acknowledge the receipt of your letter No. 7259, of the 7th November, 1903, covering a letter by the Superintendent of the Government Experimental Plantations on the subject of the encouragement of agriculture among native cultivators.

2. This subject is one which the Governments of these States have always shown every desire to foster and more than one proposal, having for its object the development of native cultivation, has received consideration and material assistance sometimes in the form of remissions of rent and sometimes by the grant of loans without interest.

3. The proposals now put forward by Mr. ARDEN are, as far as I am aware, new, free from many of the objections attendant on the forms of assistance referred to above, and likely to achieve the desired object. The extension of coconut cultivation in the Kuala Selangor district consequent on the establishment of oil mills in that locality, at any rate, proves that the natives are prepared to avail themselves of the benefits of a ready market, and there is no reason to suppose that other forms of manufacture would not equally encourage the cultivation of other kinds of agriculturai produce.

4. The form in which effect can best be given to Mr. ARDEN'S proposals is a more difficult question and one in which I do not think it possible to lay down any hard and fast rules.

For the present it seems to me it will suffice if the Government accept his proposals and notify the public by advertisement on the lines of the recent notification issued from your office to encourage the introduction of new forms of agriculture, that the Government are prepared (1) to consider proposals for the establishment of any industry which will utilise agricultural products suitable for native cultivation, and (2) in the event of their meeting with the approval of Government, to assist in their establishment and maintenance

either by loans, grants-in-aid or bounties on the out-put for a period of years.

Such advertisements should be published in Tamil and Chinese and disseminated as widely as possible in Singapore and Penang.

5. I enclose a copy of a report from Mr. HALE to whom I referred your letter under reply.

I have, etc.,

D. G. CAMPBELL,

Acting British Resident, Selangor.

THE RESIDENT-GENERAL, F.M.S.

LAND OFFICE,

L. 1352/1903. Kuala Lumpur, *23rd November, 1903.*

ENCOURAGEMENT OF AGRICULTURE AMONG NATIVES.

SIR,—

I have the honour to acknowledge your letter 6244/03, dated 12th November, 1903, forwarding a letter from the Superintendent, Experimental Plantations. I may say in the first instance that I consider Mr. ARDEN'S proposition one of great importance and bidding fair to very materially advance the prolonged prosperity of the country; it must be evident to the most casual observer that the encouragement of agriculture is the very best possible way to further the interests of the State, improve the well-being of the people, and in fact the most reasonable investment for surplus balances of revenue.

2. I think Mr. ARDEN has certainly hit upon one of the greatest factors which has kept back planting in the States, namely, the difficulty in finding a convenient market for produce without it passing through the hands of middlemen, and consequently leaving but a very small amount of profit to be shared between the grower and the manufacturer. It is quite certain if it was known that two baskets full of guavas carried to the door of a jam factory in Kuala Lumpur could there and then be sold for ready money, and that purchases would continue under a Government guarantee, the cultivation of guavas would be at once taken up by Malays. I know what an impetus was given to the planting of coconuts when the oil mills were first started at Kuala Selangor.

3. It cannot for a moment be expected that private enterprise would invest capital in ventures appearing to have such a problematical chance of success as the starting of factories in a country that is not at the time producing enough raw material to keep the machinery at work, and which would have to depend for supplies in order to make a commercial success on produce which has not yet been planted; only a Government willing to risk money in the interests of the remote future could do this, and that Government must not flinch at facing for some years expenditure without revenue.

4. Supposing that factories of various descriptions were started at Government expense, and worked by Government paid men, until all reasonable chances showed that a profit could be made, or could not be made out of the industries; I do not suppose but that Government would ultimately be able to induce the public to take a going concern off its hands, perhaps at first by selling shares in the business, if not at once by passing it over to a company or individual at a price, which need not necessarily be a full return of the outlay; the profits accruing to Government should be recognised as indirectly accruing in the way of more population, larger areas of land cultivated, and thereby a greater amount of indirect taxation paid into the Treasuries of the State.

5. And even if after money had been thus spent and the venture proved unprofitable, I do not think that Government would regret it; because there would remain the consciousness that an attempt had been made to do something on the lines of good administration and it had been proved that certain products were not worth the planting.

6. But I think the Resident wishes me to comment on Mr. ARDEN'S letter in a more particular manner, I will therefore proceed to take up some of the more salient points that occur to me.

7. *Jam Making Fruit Preserving Etc.*—It is well-known that many of the fruits of the Peninsula make admirable preserves, I may instance rulul, which makes a jelly quite equal to, and very similar to red currant jelly. Belimbing buloh (the smaller species), which when preserved is very much like gooseberry jam; and the well-known guava, the guava jelly of India—which is unfortunately generally made for sale with coarse sugar, whereby all the best qualities of the fruit are so disguised that one might as well be eating sticky treacle, whereas if carefully preserved with refined sugar it is most excellent. There are, of course, many other varieties which could also be brought into use.

The canning of pine apples has for a long time been one of the staple industries of Singapore, and might easily become so here.

The Chinese Babas and Portuguese of Malacca have acquired a reputation for preserving many varieties of fruit in syrup, and as dry candied sweetmeats.

I think that the first and most important industry to start would be this, because it would give an impetus to a class of agriculture which is essentially a part of Malay life, and certainly the factory which could put on the London market mangosteens or duriens, preserved in such a way as to retain their distinctive flavour, need not doubt of commercial success.

The proper way in my opinion to start such an industry would be, in the first instance, to obtain the services of an expert man who had learned the trade in one of the large preserving houses of England, such as Crosse and Blackwell. He should be established in a small factory, in or near a large town, so that the fruit brought to the markets could be diverted to his place of business, the competition thus set up would at once encourage a larger plantation.

The first two or three years of his work would necessarily be greatly in the way of experiment, as he would not be able to command large supplies of raw material; and his factory would be more on the lines of an experimental laboratory than a commercial undertaking. It is possible even that his experiments and the result of his work, if put on the market, would be sufficient evidence to induce members of the commercial public to start an independent factory, in which case the ends of Government would be met without further trouble; but if not, and the experiments warranted it, Government could start a real factory, to be ultimately offered to the public as a going concern. This enterprise would not be very costly; for the first three years, I think probably £1,000 a year would cover everything.

8. *Fibre.*—About the year 1890, when I was stationed at Tampin, I interested myself with the late Mr. M. W. BAIRD in investigating the matter of extracting the fibre from the banana (Pisang Karoh), which at that time covered many hundred acres of land at the hill foots, which had been abandoned by tapioca planters. A parcel of fibre was abstracted by the convicts under my orders, weighing about half a hundredweight, this Mr. BAIRD sent home to a firm on Mark Lane for valuation, with the result that it was said to be worth only about two pounds per ton less than the best Manila hemp on the market. Enquiries were made of a firm in Coventry which supplied scutching machinery for the flax trade in the north of Ireland, resulting in the information that a scutching machine requiring two horse power to actuate it would cost about £20. We found that power to work two such machines could be procured from a Pelton wheel erected on a stream coming off the Tampin hill.

In 1891 when I was at home on leave, Mr. BAIRD also being in England, we carried our investigations further, by procuring some old banana stems from Kew gardens and testing them in the Coventry machine, which with slight modifications did the work very well. And Mr. BIRCH, then Resident of Sungei Ujong, promised to give every facility to the undertaking. The above remarks are written to show that a three years' experiment in producing fibre, not only from the wild banana, but also from other fibre-producing plants, would not be very expensive, and might lead to the establishment of a very important industry.

9. *Cattle and Sheep.*—I think that one of the most important matters Government could take up, and one which would do more good than most other ways of spending available balances, would be the improving of the quality and the quantity of cattle in the States; at the present time transport, whether by rail or by road, is very expensive, and beef and mutton are both very dear.

There are in all the States very large areas of useless lalang land, than which there is no better grazing ground for cattle; and I believe that when the herbage has been improved by cattle grazing it would be equally good for sheep; during my ten years' residence at Tampin, many acres of lalang near the village were very greatly

improved in this way. Tapioca carts stopped on the way out of the State to weigh the tapioca and pay export duty, with the result that the bullocks had an hour or two run, during which they grazed, and their grazing ground, which was originally lalang, gradually changed its character and grew good grass instead. What is required is that each State should start a herd of cows, chiefly the hardy, small cattle native to the country, called variously Siamese and Kelantan cattle, this herd should be gradually improved by the introduction of larger animals from the tropical parts of Australia, larger cows should be purchased into the herd not bulls ; the delicate white Indian cattle are not at all suitable to the country, they cost too much to keep and are very susceptible to disease, whereas the native cattle, like the Australian, live on grass only. A herd of twenty-five cows and two bulls in each State, managed on the lines that all heifer calves should be retained in the herd and all steers sold, would, in a few years' time, do much to improve the grazing grounds and cheapen transport. Of course there is the risk of loss by disease, but surely Government is better able to bear that than private individuals ; and private enterprise in this direction will do very little towards improving the stock. What it will do is easily seen by the example of the Wardieburn herd, in which the introduction of one larger cow with a strain of Ayrshire blood in her, some few years ago, has made a distinct mark on the appearance of the herd.

10. There are many other points which might be enlarged upon, as, for instance, the erection of Government rice mills in the centre of large padi districts, like Rembau and Krian.

11. *Experimental Work and the Starting of a Factory for the Extraction of Essential Oils and Perfumes.*—I believe there is a business at Tampin, started some years ago, which is doing very well still, growing citronella grass and extracting the essential oil by purely native processes ; it is needless to point out that such an industry would be very grateful for Government assistance, on the lines of information as to best modes of extraction and by introducing other and unknown sources from which to extract oils, essential oils and perfumes.

12. Attempts have been made to distil a spirit from the waste product of the tapioca factories ; but they have not succeeded, investigation and experiments in this matter might be useful ; and the encouragement of sago palm cultivation is, I think, of very great importance, because it is a way of utilising the great areas of country now quite useless as swamp, and sago ataps will always fetch a big price.

13. I have written at length on three subjects only and merely mentioned others, but it is obvious that many other industries could on the same lines be encouraged, and I have no doubt will be, when a Board of Agriculture is started.

14. Mr. ARDEN has shown the necessity for some such assistance and has suggested a way in which it could be given, for my

part, *I think that rather than assisting private enterprise in the erection of machinery and factories, it would be better for Government to boldly take the matter in hand in the first instance by starting small experimental works on the lines indicated above.*

15. But whichever way it is done is perhaps immaterial, so that something shall be done as soon as possible; and agriculture, to which the country and the people are so peculiarly well adapted, shall have its fair share of recognition at the hands of Government.

I have, etc.,

A. HALE,

Collector of Land Revenue, Kuala Lumpur.

THE SECRETARY TO RESIDENT, SELANGOR.

I.C.T., F.M.S: 7-04.
R.G. Misc: 7259-04.

OFFICE OF THE INSPECTOR OF COCONUT TREES,
Federated Malay States,
Kuala Lumpur, *11th January, 1904.*

SUBJECT:

ENCOURAGEMENT OF AGRICULTURE AMONG NATIVES.

SIR,—

I have the honour to refer to my letter No. 174-03 to the Resident-General of 11th November, 1903, on this subject as I have some further suggestions to offer which the Government may perhaps care to take into consideration.

2. In the first place, I am of opinion if Government were to erect central depôts or store-houses for the collection of coconuts to be converted into copra in the districts where there are numerous native holdings scattered about and the means of transport both difficult and costly it would afford considerable assistance to the owners.

3. My scheme is that the natives should bring in all their surplus coconuts which they have to dispose of to this "central depôt" and that Government make arrangements with some Chinese, who are well up in the business, for purchasing the nuts so collected for the manufacture of copra. I do not anticipate any trouble about this, as provided the nuts are collected in sufficient abundance to allow of constant employment and this certainly should be so, it ought not to be difficult to find as at Jeram and other places, many small Chinese traders of this class who I feel sure, will be very glad of such an opening. The agreement between the contractors and the Government being that the former shall pay cash for the coconuts as received or delivered by the natives at the depôt.

4. The native owners themselves would profit by being immediately able to dispose of their produce and in addition they ought to obtain a better price than at present and these advantages might induce them with more ready cash in hand, to give more attention to their plantations.

5. The material gain and saving is in the transport and the producer should certainly reap his share of it. Suppose for instance such a depôt was erected at Rembau in Tampin District, Negri Sembilan, where there is a large area under coconut cultivation belonging to natives and there is no nearer market at present for their surplus than Seremban. The cart hire to Seremban from Rembau is at least $3 per cart carrying say only 300 to 360 nuts whereas quite seven times this quantity of nuts made into copra could be carried at same cost. Kuala Pillah is also similarly situated and I should say there are other districts where the assistance I have suggested might be found beneficial to the natives.

6. Another matter I would mention is that I consider a great deal might be done in the way of catch crops by the natives. Of course as long as many of the plantations were in the lamentable and unsatisfactory condition as when I arrived the matter appeared utterly hopeless but now some of them are keeping their plantations better, and with the conditions it was desired at the recent Residents' Conference in Taiping to impose on newly alienated land I shall endeavour during the current year to do what I can to give them some hints on the subject. My staff too without necessarily interfering with their present work might on their rounds perhaps, under my instructions, render some assistance in teaching the natives something about this.

7. Alluding to para. 8 of Mr. ARDEN'S letter of 19th September, 1903, I believe many of the apparently abandoned coffee lands, where there are few of the coffee trees still to be seen, might be well worth recultivating by the natives; the ground would not be very difficult to clean, many of the coffee trees could I think be brought into bearing and the sale of the product go a long way towards expense of upkeep. Coconuts and other catch crops could also be planted where the useless coffee trees have to be dug out and in other vacant spaces.

8. In conslusion my further suggestion and one I strongly recommend, is that a system of rewards, for some time at least, be introduced and prizes given for well kept plantations as an inducement to the natives to take more interest in cultivation generally.

I have, etc.,

L. C. BROWN,

Inspector of Coconut Trees, F.M.S.

The Federal Secretary, F.M.S.
Kuala Lumpur.

The Proposed Agri-Horticultural Show at Kuala Lumpur.

The Editor Agricultural Bulletin, S. S. & F.M.S.

Dear Sir,

A meeting of the local standing committee of the Agri-Horticultural Shows, which is has been decided to hold annually throughout the colony and the Federated Malay States, was held at the Land Office Kuala Lumpur on the 1st February.

Mr. W. W. BAILEY chairman of the United Planters Association presided and Mr. STANLEY ARDEN was appointed Secretary to the Committee. Mr. H. N. RIDLEY Director of the Singapore Botanic Gardens was also present.

It was proposed to hold the first Show in Kuala Lumpur during the month of July next, and, subject to the consent of the Turf Club, the race course was selected as the most suitable site, so as to allow ample space for turn-outs, jumping and driving competitions.

It was decided to divide the Show into the following classes :—

A. Agricultural produce
B. Flowers, fruits and vegetables
C. Stock (cattle, pigs, goats, poultry, rabbits &c)
D. Horses and Dogs (including driving and jumping competition.
E. Native industries and Manufactures, Agricultural Implements and Miscellaneous.

The Government of the Federated Malay States has voted the sum of $2,000 towards the expenses, and it is hoped that by means of special prizes and private subscriptions, the committee will be enabled to issue a substantial prize list.

I have, etc.,

STANLEY ARDEN,

Secretary to Local Standing Committee.

Rainfall for January, 1904 :—

The Prison	...	Ins.	9-76
The Fort	...	,,	11-72
Government Hill	...	,,	9-82
Balek Pulau	...	,,	8-39
Pulau Jerajak	...	,,	13-66
Lumut	...	,,	8-10
Pangkor	...	,,	9-55
Bruas	...	,,	8-81
Sungei Bakap	...	,,	14-90
Butterworth, P. W.	...	,,	12-16
Bukit Mertajam	...	,,	9-52

M. E. SCRIVEN,

Assistant Surgeon,
Prison Observatory

Penang, 11th February, 1904.

MISCELLANEOUS.

Notices to Subscribers.

I. For the information of subscribers and others who have been unable to complete their series of the Agricultural Bulletin of the Straits and Federated Malay States notice is here given that Nos. 1, 7, 8, 9, of the Old Series (1891–1900) and Nos. 1, 8, 9, 10, of the New Series Vol. 1 (1901–1902), the first issues of which have long been exhausted, are now being reprinted, with plates, and will shortly be ready.

II. Subscribers whose subscriptions are still unpaid are requested to send in their subscriptions for the present year as soon as possible. Members of the United Planters Association are requested to send in their subscriptions in future directly to the Editor and not to the Secretary of the Association.

II. Subscribers outside the Peninsula will in future be charged $3.50 per annum instead of $3 in order to cover postage.

Meteorological Observers are asked to send in their returns to the Editor, to arrive before the 10th day of the following month if possible, so as to be in time for going to press.

Wanted Nos. 8 & 9 of Vol. 1 (N. S.) of the Bulletin to complete the volume. Address F. B. Manson, Park View, Fytche Road, Rangoon.

SINGAPORE MARKET REPORT.

January, 1904.

Articles.	Quantity sold.	Highest price.	Lowest price.
	Tons.	$	$
Coffee—Palembang	40	30.00	29.00
Bali	156	24.00	22.00
Liberian	317	25.00	22.00
Copra	2,370	8.87½	7.50
Gambier	2,097	12.25	11.37½
Cube Gambier, Nos. 1 & 2	330	17.50	15.00
Gutta Percha, 1st quality	...	270.00	200.00
Medium	...	190.00	100.00
Lower	...	120.00	17.00
Borneo Rubber	...	145.00	82.00
Gutta Jelutong	...	8.25	7.75
Nutmegs, No. 110's	...	68.00	56.00
No. 80's	...	106.00	80.00
Mace, Banda	...	170.00	130.00
Amboyna	...	125.00	100.00
Pepper, Black	988	33.00	30.75
White	366	51.00	49.50
Pearl Sago, Small	40	5.90	5.40
Medium	...	...	...
Large	...	...	...
Sago Flour, No. 1	2,905	4.30	4.15
No. 2	255	1.60	1.50
Flake Tapioca, Small	932	5.25	4.65
Medium	50	...	...
Pearl Tapioca, Small	688	4.85	4.55
Medium	657	4.75	4.35
Bullet	...	...	...
Tin	3,249	87.37½	79.00

(*A*)

Exports from Singapore and Penang to Europe and America.

For fortnight ending 15th January, 1904.

Wired at 2.50 p.m. on 16th January, 1904.

To England.

			Tons Steamer.
Tin	from Singapore & Penang	to England and U. K. optional any ports.	1,375
Gambier	from Singapore	to London	...
,,	,, ,,	,, Liverpool	...
,,	,, ,,	to U. K. & / or Continent	700
,,	,, ,,	to Glasgow	...
Cube Gambier	,, ,,	,, England	20
White Pepper	,, ,,	,, ,,	180
Black ,,	,, ,,	,, ,,	...
White Pepper	,, Penang	,, ,,	10
Black ,,	,, ,,	,, ,,	10
Pearl Sago	,, Singapore	,, ,,	100
Sago Flour	,, ,,	,, London	340
,, ,,	,, ,,	,, Liverpool	...
,, ,,	,, ,,	,, Glasgow	...
Tapioca, Flake	,, Singapore & Penang	to England	420
,, Pearl & Bullets	,, ,, ,,	,, ,,	80
,, Flour	,, Penang	,, ,,	850
Gutta Percha	,, Singapore	,, ,,	10
Buff hides	,, ,,	,, ,,	30
Pineapples	,, ,,	,, ,, cases	4,000

To America.

Tin	from Singapore & Penang		900
Gambier	,, Singapore	Sailing 600	600
Cube gambier	,, ,,		10 50
Black Pepper	,, ,,		70
,,	,, Penang		40
White Pepper	,, Singapore		...
,,	,, Penang		...
Nutmegs	,, Singapore & Penang		2
Tapioca, Flake & Pearl	,, ,, ,,		210 50
Pineapples	,, ,,		cases 1,750
Sago Four	,, ,,		200

To the Continent.

Gambier	from Singapore	to South Continental Ports	100
,,	,, ,,	,, North ,,	20
Black Pepper	,, ,,	,, South ,,	10
,,	,, ,,	,, North ,,	10
Black Pepper	,, Penang	,, South ,,	...
,,	,, ,,	,, North ,,	...

			Tons Steamer
White Pepper	from Singapore	to South Continental Ports	10
"	" "	.. North " -	70
"	" Penang	to South Continental Ports -	...
"	" "	" North " -	20
Copra	" Singapore & Penang	to Marseilles -	100
"	" "	" Odessa -	...
"	" "	" South Continental Ports - other than Marseilles and Odessa	300
"	" "	" North Continental Ports -	...
Tin	" "	" Continent -	311
Tapioca Flake	" "	" " -	90
Tapioca Pearl	" "	" " -	300
Cube gambier	" Singapore	" " -	80
Pineapples	"	" "	cases 2,500
Sago Flour	"	" " -	1,400

N.B.—By "South Continental Ports" are to be understood all inside and by "North Continental Ports" all outside Gibraltar.

900 tons Gambier
220 " Black Pepper
(*in Singapore*)
} contracted for during fortnight ending as above.

Telegraphed to A. A. Niblett, Ingram House, 165, Fenchurch Street, London, E. C.

(*B*)

Exports from Singapore and Penang to Europe and America.

For fortnight ending 31st January, 1904.

Wired at 3.25 p.m. on 2nd February, 1904.

To England:—

			Tons Steamer
Tin	from Singapore & Penang	to England - and U. K. optional any ports	1,171
Gambier	from Singapore	to London -	20
"	" "	to Liverpool-	...
"	" "	to U. K. & / or Continent -	370
"	" "	" Glasgow -	...
Cube Gambier	" "	" England -	60
White Pepper	" "	" " -	120
Black "	" "	" " -	80
White "	" Penang	" " -	...
Black "	" "	" " -	...
Pearl Sago	" Singapore	" "	60
Sago Flour	" "	" London -	30
"	" "	" Liverpool -	...
"	" "	" Glasgow -	...

			Tons Steamer.
Tapioca, Flake	from S'gapore & P'nang to England	-	220
,, Pearl & Bullets	,, ,, ,, ,, ,,	-	140
Tapioca Flour	,, Penang to England	-	600
Gutta Percha	,, Singapore ,, ,,	-	30
Buff hides	,, ,, ,, ,,	-	10
Pineapples	,, ,, ,, ,,	cases	9,500
To America:—			
Tin	from Singapore & Penang	-	1,091
Gambier	,, ,,	sailing 100	825
Cube Gambier	,, ,,	-	40
Black Pepper	,, ,,	-	100
,,	,, Penang	-	150
White Pepper	,, Singapore	-	20
,,	,, Penang	-	...
Nutmegs	,, Singapore & Penang	-	9
Tapioca, Flake & Pearl	,, ,, ,,	sailing 600	210
Pineapples	,, ,, ,,	cases	1,000
Sago Flour	,, ,, ,,	-	100
To the Continent:—			
Gambier	from Singapore to South Continental Ports		70
,,	,, ,, ,, North ,,	-	30
Black Pepper	,, ,, ,, South ,,	-	30
,,	,, ,, ,, North ,,	-	50
,,	,, Penang ,, South ,,	-	...
,,	,, ,, ,, North ,,	-	...
White Pepper	,, Singapore ,, South ,,	-	...
,,	,, ,, ,, North ,,	-	10
,,	,, Penang ,, South ,,	-	...
,,	,, ,, ,, North ,,	-	...
Copra	,, Singapore & Penang to Marseilles	-	100
,,	,, ,, ,, Odessa	-	920
,,	,, ,, ,, South Continental Ports- other than Marseilles and Odessa.		...
,,	,, ,, ,, North Continental Ports-		...
Tin	,, ,, ,, Continent	-	105
Tapioca Flake	,, ,, ,, ,,	-	...
Tapioca Pearl	from Singapore & Penang to Continent	-	110
Cube gambier	,, Singapore ,, ,,	-	40
Pineapples	,, ,, ,, ,,	cases	500
Sago Flour	,, ,, ,, ,,	-	750

N. B.—By "South Continental Ports" are to be understood all inside and by "North Continental Ports" all outside Gibraltar.

550 tons Gambier
530 ,, Black Pepper
(in Singapore)
} contracted for during fortnight ending as above.

Telegraphed to A. A. Niblett, Ingram House, 165, Fenchurch Street, London, E. C.

Singapore.

Abstract of Meteorological Readings for the month of January, 1904.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew point.	Humidity.			
	Ins.	°F.	°F.	°F.	°F.	°F.	°F.	Ins.	°F	%		Ins.	Ins.
Kandang Kerbau Hospital Observatory	29·898	127·8	76·5	82·2	72·1	10·1	75·0	·821	73·9	86·0	N.E.	20·36	7·37

K. K. Hospital Observatory,
Singapore, 12th February, 1904.

A. B. LEICESTER,
Meteorological Observer.

D. K. McDOWELL
Principal Civil Medical Officer, S.S.

Penang.

Abstract of Meteorological Readings for January, 1904.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
	ins.	°F	°F	°F	°F	°F	°F	ins.	°F	%		ins.	ins.
Criminal Prison Observatory	29·896	139·7	79·2	88·4	73·6	14·8	74·7	·777	70·25	73	North	9·76	2·26

Colonial Surgeon's Office,

Penang, 8th February, 1904.

M. E. SCRIVEN,

Asst. Surgeon.

T. C. MUGLISTON,

Colonial Surgeon, Penang.

Malacca.

Abstract of Meteorological Readings for January, 1904

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew point.	Humidity.			
	ins.	°F	°F	°F	°F	°F	°F	ins.	°F	%		ins.	ins.
Durian Daun Hospital.	29·840	161·4	78·5	89·5	69·7	20·9	80·8	10·37	69·7	96	N.E.	8·18	4·45

Colonial Surgeon's Office,
Malacca, 18th February, 1904.

F. B. CROUCHER,
Colonial Surgeon, Malacca.

Selangor.

Abstract of Meteorological Readings in the various Districts of the State, for January, 1904.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature. Mean Dry Bulb.	Temperature. Maximum.	Temperature. Minimum.	Temperature. Range.	Hygrometer. Mean Wet Bulb.	Hygrometer. Vapour Tension.	Hygrometer. Dew Point.	Hygrometer. Humidity.	Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
General Hospital, Kuala Lumpur	29.855	146.0	79.2	88.2	67.8	20.4	75.6	0.822	73.3	81	S.W.	12.03	2.16
Pudoh Goal Hospital ,, ...	...	...	...	...	...	...	...	...	...	...	...	12.92	2.76
District Hospital ,, ...	...	...	...	...	...	...	...	...	...	...	...	14.01	4.23
District Hospital Klang	...	...	...	82.7	72.6	10.1	...	...	...	...	...	8.63	1.41
,, Kuala Langat	...	...	...	83.0	69.2	13.8	...	...	...	...	...	11.41	1.60
,, Kajang	...	...	...	88.8	71.5	17.3	...	...	...	...	...	10.39	4.12
,, Kuala Selangor	...	...	...	85.3	74.7	10.6	...	...	...	...	...	10.90	3.69
,, Kuala Kubu	...	...	...	87.6	71.7	15.9	...	...	...	...	...	23.91	5.90
,, Serendah	...	...	...	88.8	75.9	12.9	...	...	...	...	...	17.24	3.35
,, Rawang	...	...	...	83.9	71.7	12.2	...	...	...	...	...	21.56	5.56
Beri-beri Hospital, Jeram	...	...	...	...	...	...	...	...	...	...	...	11.92	3.89
Ulu Gombak	...	...	...	...	...	...	...	...	...	...	...	12.45	3.10

State Surgeon's Office,
Kuala Lumpur, 15th February, 1904.

E. A. O. TRAVERS,
State Surgeon, Selangor.

Negri Sembilan.

Abstract of Meteorological Readings for December, 1903.

DISTRICT.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
	ins.	°F	°F	°F	°F	°F	°F	ins	°F	%		ins.	ins.
Seramban, ...	...	...	...	...	...	...	...	...	...	...	...	6·71	1·48
Kwala Pilah, ...	...	...	...	...	...	...	...	...	...	...	...	...	...
Tampin, ...	...	...	...	...	...	...	...	...	...	...	...	...	...
Jelebu, ...	...	...	...	...	...	...	...	...	...	...	...	...	...
Port Dickson, ...	...	...	...	...	...	...	...	...	...	...	...	...	...

Colonial Surgeon's Office,
Seremban, , 1903.

J. SHEPLEY PART, M.D.
Surgeon.

Pahang.

Abstract of Meteorological Readings in the various Districts of the State, for December, 1903.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
Kuala Lipis, ...	...	...	...	92·0	70·0	16·5	...	...	...	...	...	11·88	2·50
Raub, ...	...	...	...	85·0	68·0	13·6	...	...	...	...	...	10·01	1·36
Bentong ...	...	...	...	88·0	68·0	11·6	...	...	...	...	...	6·57	1·09
Pekan ...	...	...	...	86·5	71·0	9·1	...	...	...	...	...	26·12	9·70
Kuantan ...	...	...	...	...	...	...	...	...	...	...	...	...	...
Temerloh ...	...	...	...	...	...	...	...	...	...	...	...	...	...

S. LUCY,
State Surgeon, Pahang.

Kuala Lipis, 3rd February, 1904.

Pahang.

Abstract of Meteorological Readings in the various District of the State, for the month of January, 1904.

District.		Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature. Mean Dry Bulb.	Temperature. Maximum.	Temperature. Minimum.	Temperature. Range.	Hygrometer. Mean wet Bulb.	Hygrometer. Vapour Tension.	Hygrometer. Dew Point.	Hygrometer. Humidity.	Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
Kuala Lipis,	...	...	...	...	91·0	69·0	16·0	...	...	...	...	...	17·80	3·11
Raub,	...	...	...	...	85·0	69·0	13·0	...	...	...	...	...	15·50	2·56
Bentong	...	...	...	...	86·0	66·0	10·8	...	...	...	...	...	25·74	2·95
Pekan	...	...	...	...	83·0	71·0	6·7	...	...	...	...	...	25·94	4·73
Kuantan	...	...	...	...	84·0	75·0	9·0	...	...	...	...	...	12·12	2·19
Temerloh	...	...	...	...	90·0	70·0	20·0	...	...	...	...	S.W.	7·68	2·10

S. LUCY,
State Surgeon, Pahang.

Kuala Lipis, 22nd February, 1904.

Muar.

Abstract of Meteorological Readings for January, 1904.

District.	Mean Barometrical Pressure at 32° Fah.	Temperature.					Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
		Maximum in Sun.	Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew point.	Humidity.			
Lanadron Estate.	...	...	78·5	87	70	17	71·5	...	...	...	...	12·44	5·02

Muar, 2nd February, 1904.

ROGER PEARS.

No. 3.] MARCH, 1904. [VOL. III. PART I.

AGRICULTURAL BULLETIN

OF THE

STRAITS

AND

FEDERATED MALAY STATES.

EDITED BY

H. N. RIDLEY, M. A., F. L. S.,

Director of Botanic Gardens, S. S

CONTENTS.

Annual Subscription—Three Dollars.
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SINGAPORE:

PRINTED AT THE GOVERNMENT PRINTING OFFICE.

NOTICE.

The Scientific and Technical Departments of the Imperial Institute.

His Excellency the Governor has received a despatch from the Right Hon'ble the Secretary of State for the Colonies calling attention to the advantages offered by the Imperial Institute to Merchants, Planters and others, who may wish to have samples submitted to scientific experts for opinion as to their commercial value, &c. The following extracts from a Memorandum published by the Authorities of the Imperial Institute will give an idea of the work undertaken and carried on there.

"The Scientific and Technical Department of the Institute has "been established to acquire information by special enquiries and "by experimental research, technical trials and commercial valua-"tion regarding new or little known natural or manufactured pro-"ducts of the various Colonies and Dependencies of the British "Empire and of Foreign Countries, and also regarding known "products procurable from new sources, and local products of "manufacture which it is desired to export. This work is carried "out with a view to the creation of new openings in trade, or the "promotion of industrial developments."

2. In an extensive and well equipped series of Research Laboratories, a numerous staff of skilled chemists under the direction of Professor Wyndham R. Dunstan, M.A., F.R.S., carry out the investigation of the chemical constitution and properties of new dye-stuffs, tanning materials, seeds and food-stuffs, oils, gums and resins, fibres, timbers, medicinal plants and products, with a view to their commercial utilization. Whenever necessary these materials are submitted to special scientific experts, by whom they are made the subject of particular investigation or practical tests. Reports are also obtained from technical or trade experts in regard to the probable commercial or industrial value of any such products, while full information is collected from official or other trustworthy sources regarding the probable extent and cost of available supplies.

Reports on the results of enquiries or experimental investigations are supplied as a rule, without charge, but should special expenses be incurred in connection with any such reports, or with the commercial value of particular materials or manufactured products, which the Council do not consider themselves warranted in meeting, a statement of such outlays will be furnished, for repayment, when the Reports are supplied. Should an investigation or report of exceptional character be asked for by a Government Department, an estimate of the attendant expenses will be submitted, with a view to ascertain whether authority for such expenditure will be given.

AGRICULTURAL BULLETIN

OF THE

STRAITS

AND

FEDERATED MALAY STATES.

No. 3.] MARCH, 1904. [VOL. III. PART I.

A BRIEF RUBBER REVIEW.

Excluding Central America and Mexico about half the world's supply of raw rubber is exported from South America. In his Consular Report on the trade of Para for the year 1902, Mr. Consul CHURCHILL states that the rubber exported from Pará and Manáos amounted to 26,933 tons. As the price of Pará for that year, which started at 3*s*. 6*d*. fell to 2*s*. 11*d*. and closed at 3*s*. 8*d*. would be above 3*s*., the total value approximates £10,000,000. An analysis of these figures should be pleasant reading for all concerned in the future of rubber in the Straits and Native States.

Rubber is said to be found in Brazil over an area of at least, 1,000,000 square miles, a good authority considers this an under estimate, but the collecting grounds are gradually becoming remote and difficult of access. Of the Rubber shipped at Manáos a proportion is reported as having come from far off Bolivia brought down thousands of miles by intricate rivers, necessitating a good deal of manual transport. What area is prospected to obtain the 1902 export it is difficult to say, it appears however that what is shipped at Pará and Manáos the two great centres, runs into thousands of mile in respect of distance. A better idea of what this really means may be obtained by calculating the probable output per tree. I find it stated that 100 large trees in the best districts of Brazil have given as much as one ton of rubber, that is about 22 lbs. per tree. As much could be done here but with the same result, viz., several years would elapse while the trees recovered before being fit for subsequent tapping. It is possible, for the reason that trees in Brazil are indigenous and not cultivated and whether trees recover from severe tapping does not concern the rubber collector, more would be obtained in Brazil tree for tree than would be attempted under cultivation, but as all trees in the vicinity of rubber camps are tapped irrespective of size, the average result could not be much different than from trees of uniform size. I consider Para Rubber under ordinary conditions is capable of furnishing a gross average return in full bearing of not less than 3 cwt. per acre, and I assume that there would not be less than 125 trees per acre. On this moderate estimate, to produce 26,933 tons

of rubber more than 20,000,000 trees would have to be tapped. When it is reflected, the immense area that has to be traversed to obtain this output, the enormous expense incurred, the heavy government tax 23%, it will be better understood of the scope that offers itself for successful and remunerative cultivation in the Straits and Native States.

On the same estimate the whole Brazilian output of Rubber (26,933) tons could be produced on 179,550 acres under cultivation.

For the year 1903 the market appears still more favourable. Imports into England were larger and prices advanced, commencing at 3*s*. 8*d*. falling to 3*s*. 4*d*. rising to 4*s*. 7*d*. and closing at 3*s*. 11*d*. This larger demand being due to activity in the motor industry and a growing use for rubber foot-pads.

Considering the world's demand for Rubber, about 60,000 tons, and the success and facilities for planting in the Straits and Native States, and that all the seed bearing trees of Para Rubber in the East are in Ceylon or the Straits, more extensive planting and the utilization of the seed crops for the next few years would give this country a lead it would be impossible to catch.

R. DERRY.

RUBBER IN "FIRST HANDS."

When one studies the countries which yield rubber naturally, and the conditions of life in them, it becomes easy to understand why the cost of this product remains so high as compared with most other materials in wide use. Another page of this Journal is devoted to some extracts from a recent work by a scientist who, in the study of Brazilian Indian tribes, came now and then in contact with rubber camps of the type from which is gained a great share of what we call "Para rubber," and while this explorer has not undertaken to write a report on rubber we feel that he has contributed to an understanding of the rubber situation by his incidental references to the subject.

There is no other class of intelligent men, of equal number, at work in any part of the world to-day, under such conditions of isolation and deprivation as the *patróns* whom Mr. STEERE met on the river Purus, living on unsalted fish and wild game, in a climate where it rains every day, even in the "dry season," and in constant danger from fevers; with no other society than that of their Indian employés, who can hardly be congenial, even though "civilized and Christian," as Mr. STEERE expresses it; with perhaps no communication with the outside world until the yearly floods drive everybody from the scene of their work.

The isolation of the American farmer in pioneer days was not comparable with that of the owner of a rubber camp; the one had neighbours of his own kind, the other is obliged by the nature of his work to go far away from every other camp to find fresh rubber fields. The pioneer farmer, too, was inspired by the hope of found-

ing a home, a community and a state, none of which things can result from the efforts of the rubber man. He may hope to grow rich some time and return to civilization—but he never does. If his shipment this year brings a good return at Manáos or Pará, he spends the money freely in relaxation after a year's drudgery; if not—and too often this is true—he begins the new year in debt to his merchant, and to the other features of a hard life, is added the dispiriting task of paying off old scores.

Of course we may say that these men are not obliged to hunt rubber against their will, and of course people in civilized lands to whom the use of rubber brings added luxuries are not called upon for sympathy for their exiled fellowmen whose work contributes so much to their comfort. At the same time we feel that our readers will at least be interested, now and then, in such side lights on the business of collecting rubber as explorers may happen to give us, even if for no other reason than it helps to explain the high cost of the chief raw material of their industry. One other consideration is that, with the business of gathering wild rubber attended by such conditions, which it seems impossible to improve, the cultivation of the product in more favourable latitudes receives its strongest encouragement.

"*India Rubber World January 1, 1904, p. 107.*"

Recovery of Para rubber Trees injured by fire.

LUMUT,
January 24th, 1904.

Dear Sir,—I noticed in the Agricultural Bulletin in a report on fungoid growth on Para Rubber in Ceylon that the Director of Agriculture refers to the great recuperative powers of para rubber trees. I was aware of the fact that if a tree were broken by wind, etc. it would sprout again, but do not know if any observations have been recorded with reference to fires. I therefore write to let you know of a case I have noticed here, you may have heard of similar ones, if not, the following may be of interest.

There are three young trees in a Chinese plantation planted with young coconuts, they are about 4″ in diameter, the only trees to be seen in the neighbourhood and struck my eye owing to their being on the edge of the bridle path, their height is about 15 to 20 ft.

Some months ago I noticed that the lalang, etc., had been burnt and that the Para trees appeared to have been destroyed too, they had lost all their leaves and the bark was scorched and blackened. Lately, perhaps a month or six weeks ago, I saw that they were sprouting again and to-day when riding past I got off to examine them more closely.

The first tree is sprouting about 4 or 5 ft. from the ground on the trunk, one side of it is dead the bark coming away in flakes and the wood on being cut being dead, new bark is forming a ridge

where the dead woods ends, the other side is quite healthy and latex flows on being cut, one of the branches above on that side is putting out leaves but the others still show no signs of life. I could not reach up to try them with a knife.

The second tree is sprouting about 5 or 6 ft. from the ground where it branched before, there is a good tuft of foliage but the old branches seem dead, I could not reach them to try them with a knife or break one of them off, the bark appears to be cracked and dead on them.

The third tree is sprouting about 3 ft. from the ground on the trunk, above that the stem is quite dead, I cut into it all round and found no sign of vitality.

The trees are of no value to the owner of the plantation, being the only three on it, and have not had any attention paid to them since they were first burnt or scorched, they are sprouting again simply from their own vitality.

R. SCOTT.

Mr. SCOTT'S note on the recovery of Para rubber trees gives another illustration of the vitality of the plant. It will be interesting to see if the trees completely recover and develop into strong plants again. The danger to a tree burnt on one side badly is from the attacks of fungi on the dead portion which may be too extensive for the young bark to cover, rot once getting in to the heart of the tree is sooner or later fatal, though the tree continues to give latex abundantly from the uninjured portion, or as it appears even more abundantly than in the case of a thoroughly sound tree. A good deal depends on the age or rather size of the tree damaged, younger trees would stand fire probably better than old ones, and would repair better. I have seen an old stump about 7 feet tall, and about a foot through which constantly puts fresh shoots, but these come to nothing, the decay of the interior of the trunk goes on downwards slowly, and the young shoots make no growth. The injury is too extensive to be covered with fresh bark. Several trees of considerable size were accidentally scorched at the base by a fire. One died soon from the attacks of fungi, perhaps helped on by boring beetles. The fungi spread to the roots and attacked the trees on either side two or three of which died in about a year or two.—*Editor.*

CASTILLOA RETURNS.

In the Bulletin of the Para Museum, Dr. JACQUES HUBER (Vol. III Feb. P. 84) gives an account of the yield of some trees of Caucho (Castilloa elastica).

He says a grown up tree yields as a rule one vessel full of latex which contains 14 gallons. This quantity corresponds with 20 kilogrames of Caucho in slabs and as one slab weighs generally about 60 kilos or one man's load it takes 3 trees to make a slab.

But there are trees of exceptional size furnishing much more latex. He heard from a Cauchero that one of his workmen came back from an excursion in the woods and said that he had found the mother of Caucho, a tree of such extraordinary dimension that no native dared to tap it. Finally when it was tapped it did not yield less than 231 lbs. of Rubber. (From the India Rubber World.)

The size of these extraordinary trees is not mentioned, but they must be truly gigantic.—*Ed.*

RUBBER NEWS FROM MANÁOS.

Mr. L. GARNIER writes from Manáos "as to exhaustion Caucho is done for as far as the Upper Amazon is concerned and there is very little left in Bolivia or in Peru. There still exist however immense tracts of Caucho bearing land in Colombia, Ecuador and Venezuela and in Matto Grosso (Brazil).

Rubber (*i.e.*, Para rubber) too, is gradually being exhausted and in my opinion unless serious steps are taken by the Government to protect the rubber trees in another twenty years it will be all over with the rubber industry in Amazonas.

You may expect to hear of considerable tracts of rubber producing country in Colombia being opened up. I refer to the Putumayo or Ica river district which has a potential of 1,300 tons of rubber per annum not counting Caucho or Balata in the parts already explored although in consequence of international squabbling it is not yet opened out. There are enormous tracts of Rubber on the Alto Maraonu which however will not be of any commercial importance for many years on account of the Indians."

"*India Rubber World.*"

NOTES FROM THE BULLETIN OF THE IMPERIAL INSTITUTE.

The Bulletin of the Imperial Institute are published as a supplement to the Board of Trade Journal at the price of one penny. They contain accounts of the work of that institute and reports on the investigations on colonial products carried out in the laboratory, many of which are of the greatest interest to planters and merchants of the East.

The work done lately in the Court devoted to the Straits Settlements and British North Borneo is described as follows:—

Straits Settlements and Federated Malay States —Considerable progress has been made in the re-organisation of this Court, on a plan prepared last year by Professor DUNSTAN, which was approved by the Government of the Straits Settlements, by whom the work of collecting and preparing in the Colony the new exhibits required was entrusted to Mr. H. N. RIDLEY, M.A., Director of Botanic Gar-

dens and Forests at Singapore. Much assistance has kindly been given by Mr. LEONARD WRAY, F. Z. S., Curator of the Government Museum at Perak, whilst on leave in this country.

The Straits Court is being re-modelled in accordance with the general scheme for the improvement of the collections, the object in view being to render the exhibits of greater value to commercial men, for educational progress, and as a means of bringing to public notice recent development in economic research. To this end the specimens have been thoroughly overhauled and a representative series selected for exhibition. Temporary labels have been added giving information describing the collection and manufacture of important products, and the local uses of other products, many of which do not appear as exports. These temporary labels are being replaced as rapidly as possible by fuller, specially prepared, printed labels, and when this work is completed it will be possible for the visitor to learn, as completely as the specimens allow, the method of cultivation, collection and manufacture of the products, and the uses to which they are put.

The tin industry has received special treatment in view of its paramount importance, and a complete series of specimens and photographs illustrating the modes of occurrence of the tin ores, the methods of mining and smelting, have been placed on exhibition with full descriptive labels.

The geology of the Peninsula is illustrated by a set of specimens with notes on the occurrence, geological age, and economic importance of the several formations.

Rice, sago, sugar, rattan canes, gutta-percha, rubbers, dammar, resins, fibres, gambier and other tanning materials, dye stuffs, spices, &c., are similarly represented by selected specimens and descriptions of their collection, manufacture and uses.

Statistical tables showing the area, population, revenue, expenditure, trade and exports, prepared by the Local Government, have been placed in the Court.

An important addition is a large map specially prepared for the Court, showing the several Settlements and States under British administration, the railways, and other features of interest.

When the new exhibits arrive and have been incorporated in the present collection the Court will give a full and accurate representation of the economic resources of the Straits Settlements and Federated Malay States, and prove an important factor in extending public knowledge of the country and furthering its commercial interests.

British North Borneo.—A collection of the commercial products of British North Borneo, including timbers, coal, rice, sago, sugar, coffee, cacao, pepper, tobacco and cigars, camphor, gutta-percha, dammar, cutch and gambier, is on view in the North Gallery.

(*Supplement to the Board of Trade Journal, October 15th, 1903, page 110.*)

From the Bulletins we extract the following notes as especially interesting to our readers here.

On poisonous fodder plants.—Among those investigated were the beans of *Phaseolus lunatus*, commonly known as Lima beans. These beans are cultivated all over the world and form an important item in the food of the Brazilians. In a wild state the plant "produces seeds which vary in colour from light brown to deep purple while under partial cultivation the seeds are usually light brown or pink with a few purple spots and when thoroughly cultivated they become much larger and the colour changes to a pale cream tint, coincident with these changes of colour in the seed coat the toxicity of the seeds decreases with cultivation. In Mauritius the plant is grown practically wild for use as a green manure." The seeds are markedly poisonous and great care is taken to prevent cattle from eating them. In India, Burmah and the Straits Settlements and other Tropical countries where *Phaseolus lunatus* is partially cultivated the pink or light brown seeds are commonly eaten but cases of poisoning by such seeds have been recorded and attention has been called to the necessity of using only light coloured seeds and rejecting as possibly poisonous those bearing much of the purple colouration. In the case of the white seeds, no cases of poisoning have been recorded.

The poison produced by the seed is prussic acid, and this does not exist as prussic acid in the seed in its ordinary state. The beans contain a glucoside *Phaseo-lunatin* and an enzyme (unorganised ferment) and when the beans are crushed and moistened with water the enzyme decomposes the glucoside which breaks up into glucose, acetone and prussic acid. In the very light brown seeds ·04 per cent. of prussic acid was found and in the deep purple seeds as much as ·08 per cent.

A case of poisoning by Mauritius beans occurred in Province Wellesley some years ago. These beans had been introduced for green-soiling the Sugar canes and some Tamils gathered a quantity of them as well as those of *Mucuna pruriens var utilis* and made a bean-curry of them. It was noticed that the beans were bitter (a fact recorded also in the Bulletin of the Imperial Institute). The results were disastrous, three persons being killed. It was doubtful at the time which of the two kinds of beans was the poisonous one but there is now I think little doubt that it was the Mauritius green-soiling bean. Thus in estates where this plant is used for manuring the natives should be warned that the beans of the plant are dangerous. I append Dr. Foston's report on this case.

Sungei Bahat,
Province Wellesley,
22nd February, 1899.

Sir,—On the evening of the 19th February, five persons were attacked with symptoms of acute poisoning after eating some cooked

beans, one was an adult kling woman and others children varying in age from 5 to 10 years on the way to Caledonia Hospital for they were Caledonia coolies. One of the children died and two others shortly after. The children were brought along in a cart and the woman not being so ill came walking to the Hospital. On admission the children who were alive were found unconscious and frothing from the mouth. Dr. SKAE was sent for, and on his arrival the youngest child and the woman were alive but collapsed with widely dilated pupils. Emetics were administered and the woman vomited up rice and particles of the beans.

The Company for experimental purposes has for some three years been planting a variety of beans from Mauritius in the cane fields but some distance away from the lines. The coolies were then warned against using these beans. On the morning of the 19th these children had gone out to gather greens. They came across beans in pods growing in the fields which they thought resembled beans they were accustomed to eat in India, and a quantity was brought home about noon, of which their mother made curry. The children ate the curry about 2 p.m. The mother too ate some of the curry but finding it bitter did not take much. Towards evening the children complained of giddiness and vomited up the food soon after they were found convulsed and unconscious with frothing from the mouth.

On the 20th I held a *post mortem* on the bodies of the three children, particles of the beans were found in the stomach. The stomach and upper part of the intestines and the kidneys were slightly congested. The blood was dark fluid. In the brain the membranes were congested, the vessels on the surface very much so and there was an appreciable quantity of fluid in the skull cavity and in the ventricles. The brain substance itself presented a very moist appearance.

The woman and the youngest child have since quite recovered.

The stomach with their contents of the deceased and other parts of the viscera were collected and made over to the police for transmission to Singapore for analysis.

I am sending you by post a packet of the beans and specimen of the plant. Will you kindly let me know the name of the plant.

I have, etc.,

ED. T. FOSTON,
Colonial Surgeon.

The Principal Civil Medical Officer,
Singapore.

Fibre of Agave Americana.—Samples of fibre of this plant were sent from Assam. The fibre was coarse but clean and of good appearance, yellowish, white in colour and with a fine gloss,

moderately long with an average staple of 3 feet 8 inches. Analysis of the fibre is given in the Bulletin and the report of two brokers who stated that it was of good quality but rather too dry and brittle, the strength colour and length satisfactory. Portions of the sample were of very good quality and equal to ordinary sisal hemp and would realise at that time (October, 1903) £35 to £38 per ton, but this price is higher than the average which would be £20 to £25 per ton. (*Imp. Inst. Bulletin*).

(*Agave Americana*, grows fairly well in the Straits Settlements, but is perhaps rather slow, slower than the Mauritius hemp. (*Fourcrea gigantea*), but faster than sisal hemp. *Agave sisalana*, which in Singapore at least seems to be the slowest in growth of any of the Aloes.)

Blumea Balsamifera.

With reference to a report from the Imperial Institute on this camphor (*see* p. 23 in January number, vol. III) Mr. Arden writes "This plant which is a member of the large and widely distributed family Compositæ, occurs fairly abundantly in open places throughout the Malay Peninsula, also in India and elsewhere.

The genus Blumea contains a large number of species, several of which it is said enter into the composition of the Ngai Camphor of commerce. The one referred to above and the one chiefly employed by the Chinese in the manufacture of this article, is a shrubby plant 8-10 ft. high, bearing loose panicles of small yellow flowers, the leaves vary in shape and when bruised smell strongly of camphor. It is known to the Malays as "Chapa" and is largely used by them medicinally as a febrifuge and stomachic, and for various complaints for which I fear it is but a fanciful remedy.

The camphor obtainable from this plant is of a very good quality, being much superior to the Formosan camphor, *Cinnamomum camphora*. Llike the Borneo or sumatra camphor (Barus camphor) the product of *Dryobalanops aromatica*, a large and slow growing tree which occurs in a few isolated places in the Malay Peninsula—notably at Rawang and Kwantan and which commands a still higher price, it seldom finds its way into the European market, what little is produced being bought up at fancy prices by the natives to it.

As stated above, the plant yielding the Ngai camphor is fairly abundant in the Peninsula, and no doubt could be easily cultivated, and if it is found that the active principle contained in the plant is present in sufficient quantity and could be profitably extracted, it would prove very useful as a "catch crop" on rubber and coffee estates. It will be seen from the report by Professor Dunstan that only a minute quantity was obtainable from the sample examined, but this may have been due to the volatile camphor escaping during transit.

Further experiments will be undertaken and if the camphor is found in sufficient quantity, its extraction locally from the fresh green plant will probably not present any great difficulty.

STANLEY ARDEN,
Superintendent, Experimental Plantations.

Batu Tiga, Selangor.

OFFICE OF THE INSPECTOR OF COCONUT TREES,
FEDERATED MALAY STATES,

Kuala Lumpur, 11th January, 1904.

SUBJECT.

ENCOURAGEMENT OF AGRICULTURE AMONG NATIVES.

Sir,—I have the honour to refer to my letter No. 174-03 to the Resident-General of 11th November, 1903, on this subject as I have some further suggestions to offer which the Government may perhaps care to take into consideration.

2. In the first place, I am of opinion if Government were to erect central depôts or store-houses for the collection of coconuts to be converted into copra in the districts where there are numerous native holdings scattered about and the means of transport both difficult and costly it would afford considerable assistance to the owners.

3. My scheme is that the natives should bring in all their surplus coconuts which they have to dispose of to this "central depôt" and that Government make arrangements with some Chinese, who are well up in the business, for purchasing the nuts so collected for the manufacture of copra. I do not anticipate any trouble about this, as provided the nuts are collected in sufficient abundance to allow of constant employment and this certainly should be so, it ought not to be difficult to find as at Jeram and other places, many small Chinese traders of this class who, I feel sure, will be very glad of such an opening. The agreement between the contractors and the Government being that the former shall pay cash for the coconuts as received or delivered by the natives at the depôt.

4. The native owners themselves would profit by being immediately able to dispose of their produce and in addition they ought to obtain a better price than at present and these advantages might induce them with more ready cash in hand, to give more attention to their plantations.

5. The material gain and saving is in the transport and the producer should certainly reap his share of it. Suppose for instance such a depôt was erected at Rembau in Tampin District, Negri Sembilan, where there is a large area under coconut cultivation belonging to natives and there is no nearer market at present for their surplus than Seremban. The cart hire to Seremban from Rembau is at least $3 per cart carrying say only 300 to 360 nuts whereas quite seven times this quantity of nuts made into copra could be carried at same cost. Kuala Pilah is also similarly situated and I should say there are other districts where the assistance I have suggested might be found beneficial to the natives.

6. Another matter I would mention is that I consider a great deal might be done in the way of catch crops by the natives. Of course as long as many of the plantations were in the lamentable

and unsatisfactory condition when I arrived the matter appeared utterly hopeless but now some of them are keeping their plantations better and with the conditions it was desired at the recent Residents' Conference in Taiping to impose on newly alienated land I shall endeavour during the current year to do what I can to give them some hints on the subject. My staff too without necessarily interfering with their present work might on their rounds perhaps, under my instructions, render some assistance in teaching the natives something about this.

7. Alluding to para. 8 of Mr. ARDEN'S letter of 19th September, 1903, I believe many of the apparently abandoned coffee lands, where there are a few of the coffee trees still to be seen, might be well worth recultivating by the natives; the ground would not be very difficult to clean, many of the coffee trees could I think be brought into bearing and the sale of the product go a long way towards expense of upkeep. Coconuts and other catch crops could also be planted where the useless coffee trees have to be dug out and in other vacant spaces.

8. In conclusion my further suggestion and one I strongly recommend, is that a system of rewards for some time at least, be introduced and prizes given for well kept plantations as an inducement to the natives to take more interest in cultivation generally.

I have the honour to be,

Sir,

Your obedient Servant,

L. C. BROWN,

Inspector of Coconut Trees,
F. M. S.

To,

The Federal Secretary, F. M. S.
Kuala Lumpur.

NOTE ON JELUTONG.

Mr. BASAGOITI, (Assistant Conservator for Selangor) in a report states that at Ulu Langat he found certain Malay rubber collectors, who said that they mixed Jelutong Getah with the bark juice of the Pagarana (Pagar Anak tree) to harden it. This juice is also say they used by fishermen for dyeing nets.

The Pagar Anak tree is *Ixonanthes icosandra*, of the order *Lineæ*.

It is a very common tree rarely of large size usually about 30 feet tall, with corymbs of petatless green flowers, and small sticky capsules.

A COCONUT PEST.

I have received from the Hon. R. BLAND, Resident Councillor of Malacca, the following letter together with a box of small caterpillars and pupæ of a moth doing much damage to Coconut trees in Malacca. He writes, "I am sending you a box containing some caterpillars that are devastating the coconut trees at Tanjong Kling. I noticed the trees were turning a kind of brown colour as if scorched with fire. The Malays tell me that the nuts are falling off the trees attacked before being ripe. I don't suppose this is any new thing but I never saw so many trees suffering in this way before. * * * * The bungalow at Tanjong Kling is filled at night with swarms of small white moths perhaps they develop from these caterpillars."

The box contained a number of portions of the leaflets of the coconut, on the underside of which were numerous elliptic scale-like coccoons, and in the box were also a number of small caterpillars. These were a little over $\frac{1}{4}$ inch long. The head and first two segments were of a dull ocre yellow shining, and appeared to be larger than the body; they were fringed with hairs; the body was dirty white with a broad black band down the back ending in two black spots; two narrower grey lines ran down each side and ended in a black spot, the belly was fuscous; there was a tuft of hair on each leg. The coccoons were in rows on the underside of the leaf close to the rib, they were elliptic in outline and little over a quarter of an inch long, of rather tough silk. In shape they more suggested a very large flat coccus. The pupa was soft and whitish with large black eyes.

The caterpillars ate short grooves on the under side of the leaves through the epidermis exposing the reticulating nervules, which turned brown, and the death of the tissue continued to the upper surface, so that the leaf above was marked with brown streaks from a quarter to an inch long. They moved about actively and when they fell from the leaf produced a long fairly stiff thread of silk by which they could lower themselves to the ground or climb up again. The greater number seem to have spun up by January 25, and began to hatch out on the 29th of the month.

The moth is very small just half an inch across the expanded wings. The antennæ are short and plumed, and with the head blackish brown, the neck lemor yellow; wings narrow dark sooty brown with a narrow yellow edge on both upper and lower ones, the body above coloured like the wings, beneath the abdomen and thorax and the long slender legs are bright lemon yellow.

The moth seems to be a species of Euproctis or an allied genus, but I am unable to find any account or figure of it in the books at my disposal.

The insect seems likely to prove very injurious. In a later letter Mr. BLAND writes "These coconut grubs line the under side of the leaf in thousands. The trees from the 6th to the 9th mile on the Tanjong Kling road look as if they had suffered from fire. The

grub turns into a small white moth. We found them laying eggs just like those on the coconut leaves about Tanjong Kling. (This is probably another insect as the moths bred were not white). The Malays say they will all disappear in a month or so and that they come every year. I have never noticed the trees looking like this before. The Malays do what they can by lighting huge fires under the trees but apparently without being able to stop the pest." Smoking the trees thoroughly seems about the best method of dealing with this class of insects. Spraying with an insecticide, such as phenyle, would probably be the most effective way of dealing with them but at present there are no spraying machines in the country which are sufficiently powerful to throw the insecticides high enough to deal with the coconut palms.

I have never noticed this pest any where myself, but coconut planters should keep a look out for it.

TOMATO DISEASE.

Growers of Tomatos here frequently lose the whole stock of plants just as the fruit is showing signs of ripening. Usually in new ground the grower finds the first crop excellent and wonders why others do not always grow them. The second growing on the same ground comes up strong and apparently healthy, till just as the fruit is ripening the whole plant suddenly withers. This is due to one of the parasitic fungi which attacks the plant usually quite young, but does not kill it till the plant is full grown. The ground being now infected future attempts at growing tomatoes there are usually complete failures.

Experiments in dealing with these fungus diseases were made not long ago by Mr. GEORGE MUSSEE of Kew Gardens, and he gives the following practical directions for treatment. (Journal Royal Horticultural Society)—Commence watering the tomato plants when a fortnight old every third day with a solution consisting of 1 oz. of sulphate of copper dissolved in 50 gallons of water. After treating for 6 weeks as above commence watering every fourth day with a solution of 1 oz. sulphate of copper in 35 gallons of water. The sulphate of copper should be pure and rainwater used if possible.

It is shown that the copper does not affect the fruits, and that no more occurs in treated fruits than in untreated ones. It may be pointed out that the fruit itself should not be touched by the sulphate of copper for fear of accidents, and that these experiments having been made in a cold country where the growth of the tomato plant is much slower than it is here, it will not be necessary to keep the treatment on so long.

Editor.

R.G.O. 9748/1903

FEDERATED MALAY STATES.

Further Paper in Continuation of Printed Papers in Connection with the Subject of Cotton Cultivation in the States.

Précis of Correspondence.

842/04. Ag. B. R., Perak.

The cotton question is now of importance, but experts do not think F.M.S. cotton of the kind hitherto produced would supply the need. Cotton sample from Taiping pronounced at home as too short and very wasty. Letter from Mr. L. Wray says: Sea-Island cotton grows well in Perak. Yielded good cotton, but rain spoilt a lot. The whole matter depends on the financial question. According to Mr. C. E. S. Baxendale, the whole crop per acre would only pay one coolie for two months.

99/04. Ag. B. R., Selangor.

Guaranteed local market is alone needed to start F. M. S. cotton cultivation. Let Government provide this and start with the Javanese at Jugra. Government can retire when English market buys. The purchaser on Government's behalf must be an expert. If such a man can be found "I am of opinion that Government can best and most cheaply help native cultivators by guaranteeing a local market at a remunerative price."

10101/03. Ag. B. R., N. Semb.

Planters in Negri Sembilan generally hold cotton-attempt would fail, the seasons being insufficiently defined. Mr. E. V. Carey thinks that the time has not yet come except for pure experiment; and all advices point to non-profitable results. But no practical result has yet been seen to justify such pessimism. Mr. Arden's proposal is good, let experiments be entrusted to planters. They would give two or three acres and supervision. Government could clear land, sow, and give result to planters. On Coast and in Seremban let planters receive seeds of all kinds quickly and start soon. Special terms should not at present be advertised for cotton in F.M.S. Should a large Company be promoted and then fail over it, later developments would be suspected or destroyed. Mr. T. Noordin at Kuala Sawah has 10,000 trees planted. In five years he expects gain of 25 cents a tree and net gain of 75 cents each tree in the 6th year. He began, but failed, with Kapas (silk cotton.)

He now grows "Kapok" or "Ka-kabu," has local market, but could easily sell at Singapore. Let Mr. Arden visit him. He plants pepper and coffee round the cotton.

627/04. Ag. B. R., Pahang.

Let Government entrust planters with experiments. Pahang land bad for cotton.

9985/03. U. P. A. (W. W. Bailey.)

Let Government select two places in Perak, three in Selangor, two in Negri Sembilan: and at each place nominate a planter willing to give five acres, and to keep exact account of cost, and crop-

proceeds, and forward monthly account to Director of Board of Agriculture. Such planters to bear half expense and receive all the crop. If this is not inducement enough, let Government try others, as { 500 free acres (prize 1) / 300 ,, ,, (,, 2) } (etc.) such prizes to be decided by Resident-General, Resident of State and Board of Agriculture, F.M.S. Mr. TREUB, of Buitenzorg, and his assistant far outstrip all our experts in knowledge *re* cotton. If Government were to send men to Java to investigate the Agricultural Department there they would receive every help. Cost of experiments above suggested £10 to £12 an acre: But let Government begin by sending to Java.

Quickest action would be to follow Mr. ARDEN'S suggestions, and see what cash actually comes from cotton and cotton-seed (oil for cows). South Sea Island cotton planted gave long staple and high price. Yield per acre unknown. Miserable Indian plantations yet give astonishingly good results, but the soil there is black and fine. Many Indian coolies here know about cotton growing, so too some Chinese. In the Province, Mr. CHASSERIAU has such coolies and might be induced to experimentalise. A fair test might be got if Mr. ARDEN took eight or ten of these (Tinnevelley) coolies, gave ploughs, etc., and opened some land on the lalang near the Gardens. Another plan would be to give Chinese coolies seed and a bonus. Chief trouble here is felt from the rain on the open bolls. Mr. G. E. BAGNALL (Bukit Nanas) would give seed up to 24 acres, with land, etc., on certain conditions at Port Dickson and Seremban, Government to stump and plough (=$50 per acre). If desired, the Protector of Labour whilst in India would get information. Where cotton is most grown, wages 2/6 to 6/- a day. Strange, *if* we can grow quality and quantity per acre, we could not compete, beginning as we should in all mechanical appliances where they have arrived."

See also: "Agricultural Bulletin of the Straits and Federated Malay States":—

No. 10 Vol. II. "Cotton," p. 309.

No. 11 Vol. II. "The Cultivation of Cotton in the F. M.S.," p. 345.

No. 12 Vol. II. "The Cultivation of Cotton in the F. M.S.," p. 396.

No. 12 Vol. II. "Cotton in the S.S. 40 years ago," p. 398.

REPORT ON A SAMPLE OF COTTON GROWN IN THE GOVERNMENT GARDENS, KUALA KANGSAR, PERAK.

SECRETARY, MANCHESTER CHAMBER OF COMMERCE, TO ROYAL BOTANICAL GARDENS, KEW.

CHAMBER OF COMMERCE, MANCHESTER,

5th December, 1903.

Yours of 30th November

DEAR SIR,—I have obtained the report of a competent expert upon the sample of cotton referred to in your letter.

The staple or fibre is described as too short for Sea Island. It is classed, without reference to its origin, as equivalent to "Fully Good Middling American" and as being worth in the market yesterday $7d.$ to $7\frac{1}{4}d.$ per lb.

The staple is further described as "rough, coarse and very wasty." By "very wasty" the expert means that in the processes preparatory to spinning this cotton would lose an inordinate amount of fibre as waste, fit only for the spinning of low counts of yarn.

Faithfully yours,

ELIJAH HELM,

Secretary.

UNITED PLANTERS' ASSOCIATION, F.M.S.

5th February, 1904.

Sir,—In continuation of my letter dated 22nd December, 1903, *re* cotton cultivation in the F.M.S., I have the honour to enclose you copies of what each member of the United Planters' Association Committee has written on the subject.

I have, etc.,

W. W. BAILEY,

Chairman, United Planters' Association.

A. R. VENNING, ESQ.,
FEDERAL SECRETARY, F.M.S.

VIEWS OF THE UNITED PLANTERS' ASSOCIATION COMMITTEE.

I consider that Mr. STANLEY ARDEN'S suggestions are good and feasible, and should be put into effect; but instead of the small areas which he speaks of being opened out, I consider that larger blocks of, say, 50 acres be planted. Places with a dry climate should be first selected, such as Port Dickson, etc.—V. R. WICKWAR.

I think Mr. STANLEY ARDEN'S alternative plan the soundest.

Mr. C. B. NISSEN (formerly planting in Klang), who has lately

returned from German New Guinea, informs me that the natives there grow cotton as a catch crop throughout their coconut plantations with great success. They overcome the difficulty of preventing their crop being damaged by wet weather by gathering the pods before they are quite ripe and then allowing them to ripen in sheds—F. M. PORCHER.

I have tried the planting of what they call South Sea cotton and my first crop has been a success as it was picked in the dry season in June and July, but my next was a failure as it came on in the wet season and was all spoilt, so I gave it up. I do not think it a good thing to ask planters to grow it on a small scale, but let Government do it on, say, 50-acre blocks in different coast districts, say, Port Dickson, and let Mr. ARDEN who has begun the initiation start blocks of 50 acres. I agree with both Mr. LAKE and Mr. SKINNER that planters could not keep things separate enough to give the actual cost per acre—W. J. COATES.

I think planters would be quite willing to assist by giving a few acres of land for experimental purposes, provided the Government paid all expenses, but I do not think the idea of prizes of grants of land a good one—HENRY F. BROWELL.

I would suggest that a planter in each district be asked to give a few acres of land to grow the different kinds of cotton, sowing same at different times during the year, and Mr. ARDEN visits those places and collects information for the use of all, also District Officers be given seed which he could supply free to suitable penghulus in his district who are likely to look after the product.

The Government would pay all out-of-pocket expenses to the planter and make an offer straight away for the purchase of properly treated cotton grown for, say, two years. In this way we would know once and for ever if cotton can be grown with success and what kind is suitable. The result might be very valuable.—C. MEIKLE.

Although little and nothing can be known about the results profitable or otherwise of cotton growing in these States unless a fairly large experiment is made in the cultivation, I consider it well worth a trial, provided the Government will pay all expenses. I do not think that an experiment for one year only will be any test, sufficient to justify planting on a large scale. A glance at the rainfall chart will show how contrary the wet seasons have been in the past.

Before starting on the experiment I should advise it being fully ascertained what pests attack the plant and the best remedy for dealing with such pests. I some time ago tried to grow what is known as South Sea Island cotton and found that the plants were all decimated by some web-spinning caterpillar, even the pods were riddled. It may be, however, that pests will not attack the trees in some soils so much as others, that is for experiment.

No doubt every planter will do what he can to assist the Government in a scheme which is worth a trial.—EDMUND B. PRIOR.

I consider the growing of cotton well worth a trial. I would suggest that selected planters with suitable soil on their estates be asked to give from 5 to 10 acres of land for the planting of different varieties: planting from seed at different times to endeavour to bring the crop to maturity during the dry season. The Government should pay at least half the cost of the experiment and supply the seed; careful detailed accounts of ependiture, date of planting seed and date of maturity should be kept and forwarded to Government.—P. W. PARKINSON.

I consider that it would be an excellent thing if experiments were made in cotton growing in the F.M.S., but consider it advisable that the Government should do it. I do not place any faith in experiments made on small scales, say, 10 acres or so here and there. The cost of opening and planting for one thing can never be truly ascertained as half the charges a large estate would have to bear are never included. Again, labour can easily be supplied to a small area which might never be obtainable for a proper-sized estate and the supervision given to an experiment so small is greatly in excess of what it could get under normal conditions.

I would suggest that the different areas be carefuly selected and then 50 acres cleared and planted in each place. This would undoubtedly cost money, but if the experiment is to be of any future use it should be done properly without sparing expense.—E. B. SKINNER.

I do not think that the idea of planters giving land for a cotton experiment a good one, as for an experiment to be any good it should be on a fairly large scale (not less than 50 acres) and the planter could not probably give sufficient attention to it in that case. Mr. ARDEN has mentioned that this crop at various times requires a large augmentation of the labour force, for this reason I agree with Mr. SKINNER that a small area of, say, 5 acres is of little use as a practical experiment.

I think five or six blocks of 50 acres each should be opened in suitably dry localities to be under the charge of an experienced planter, who would be regularly visited by a sub-committee of the U.P.A. with one Government officer, all expenses to be borne by Government.—A. B. LAKE.

COPY OF THE MINUTES OF THE FIRST MEETING
OF THE
LOCAL STANDING COMMITTEE
OF THE
Agri-Horticultural Show, held at the Land Office, Kuala Lumpur, on the 1st February, 1904, at 3.30 p.m.

PRESENT.

All the Members were in attendance, viz:—

The Chairman United Planter's Association, (Mr. W. W. BAILEY).

The Collector of Land Revenue, Kuala Lumpur, (Mr. A. HALE.)

The Superintendent Experimental Plantations, (Mr. STANLEY ARDEN.)

Mr. H. N. RIDLEY, Director Botanic Gardens Singapore, also kindly attended the Meeting.

1. On the proposal of Mr. HALE, seconded by Mr. RIDLEY, Mr. W. W. BAILEY was elected Chairman of the Committee. Mr. BAILEY consented to act.

2. It was proposed by Mr. RIDLEY and seconded by Mr. HALE, that Mr. STANLEY ARDEN be appointed Honorary Secretary to the Local Standing Committee, Selangor. Mr. ARDEN consented to act.

3. The Chairman moved, that, subject to the approval of the other Members of the Standing Committee in the Colony and the F. M. S., Mr. H. N. RIDLEY be appointed Secretary to the Standing Committee. This was seconded by Mr. HALE and agreed to unanimously.

4. The Hon. Secretary informs the Committee that the Federal Government has included the sum of $2,000 in the Estimates for the current year, towards the expenses of holding an Agri-Horticultural Show in the F. M. S.

5. It was unanimously resolved that the first Show should be held at Kuala Lumpur during the month of July 1904,—the exact date to be fixed later by the General Committee: and also, that an endeavour should be made to supplement the grant made by Government, by means of special prizes and private subscriptions.

6. It was unanimously resolved, that the following gentlemen be invited to become Patrons of the Show, viz:—

H. E. The Governor and High Commissioner.
His Highness, The Svltan of Perak.
,, ,, The Sultan of Selangor.
,, ,, The Sultan of Negri Sembilan.
,, ,, The Sultan of Pahang.
The Resident-General, F. M. S.

7. It was also unanimously resolved that the Acting British Resident, Selangor, be invited to act as President: and further, that the following gentlemen be asked to consent to act as Vice-Presidents, viz:

The Honourable, The Resident Councillor, Penang.
,, ,, ,, ,, ,, Malacca.
The British Resident, Perak.
,, ,, ,, Negri Sembilan.
,, ,, ,, Pahang.
The Raja Muda, Selangor.

8. A list of gentlemen resident in the State was drawn up, and the Secretary was instructed to invite them to serve on the Several Committees and Sub-Committees; any Committee or Sub-Committee so formed having power to add to its number.

9. It was decided to divide the exhibits into five divisions, as follows:—

Division A. Agricultural Produce.—(To include oils, gums, fibres, spices, dyes, rattans, &c.)
,, *B. Fruits, Vegetables and Flowers.*—(To include wild and cultivated fruits, vegetables, decorative plants in pots, cut flowers, table decorations, &c.)
,, *C. Stock and Dairy Produce.*—(Cattle, pigs, goats, poultry and rabbits: butter, eggs, &c.)
,, *D. Horses and Dogs.*—(To include driving and jumping competitions, turnouts, &c.)
,, *E. Native Industries and Manufactures: Agricultural Machinery and Miscellaneous.*—(Exhibits for competition in this division, to be confined to articles manufactured in the Colony of the S. S. or the States of the Malay Peninsula.)

Suggestions.

The following suggestions, to be brought forward at a Meeting of the General Committee, were also made:

1. That the Show should be held on the Race Course.
2. ,, ,, Turf Club be asked to kindly grant the Show Committee the use of the race course for the purpose.
3. ,, ,, Date of the Show should be about the end of July, but not on such a date as will interfere with the race-meeting:
4. ,, ,, Show should remain open for 3 days.
5. ,, ,, Price of admission should be as follows:—1st day, \$1; 2nd day 50. Cts. (9 a.m.–2 p.m.), 3rd day 25 Cts. Family tickets of admission for the three days \$3.

The Meeting adjourned at 5.20 p.m.

H. N. RIDLEY, Esq. M. A.
Singapore.

FALL OF HAIL IN ULU LANGAT.

KAJANG,
Selangor, 8th March, 1904.

DEAR SIR,

At 3 p.m. on March 2nd, 1904, a violent storm swept over the district of Ulu Langat. When it struck Kajang it did considerable damage blowing down thirty trees in the District Officer's garden and about the same number elsewhere in the town. The wind was high and a good deal of rain fell, and, with the rain, a heavy shower of hailstones. Some of them were collected by the peons in the District Office and brought to me. They were about half an inch long and about a quarter of an inch in thickness. I had always believed that the Malay Peninsula was exempt from hailstorms, but this occurrence shows that they are not impossible.

I remain,
Yours very truly,
C. W. HARRISON,
Acting District Officer,
Ulu Langat.

The Editor,
"Agricultural Bulletin,"
Singapore.

The occurrence of hail in the Peninsula is certainly very rare. Perhaps some of our readers can recall similar cases but none have come within my own observation.—(*Editor.*)

A NEW POPULAR WORK ON COCOA.

Mr. HARRISON sends us a small popular work entitled "The food of the Gods", a popular account of cocoa, by Mr. BRANDON HEAD. The little work is prettily illustrated with photographs and other pictures, and maps showing the whole of the history of cocoa, cultivation implements, and the plant itself of which there is a good coloured figure and also illustrations of Messrs. CADBURY'S factory at Bournville. Though the work is perhaps hardly adequate to the needs of the cocoa-planter, as a popular account of the history cultivation and manufacture of chocolate it contains a good deal of interesting matter and is very well got up.

Editor.

A CATERPILLAR ATTACKING PEPPER PLANTS.

A correspondent sends from Port Dickson some caterpillars found devouring pepper, eating the base of the leaves and young

shoots and though not actually killing the plants preventing them from bearing.

The pest is one of the moth caterpillars called Nettle worms, of the group of *Limacodidæ.* It is an inch long and very thick, and slug-shaped the back all except its head is bluish white thickly covered with radiating tufts of sharp blue or white species, the head and belly smooth and dirty yellow. At the tail there is a bare patch yellowish in colour with 4 black velvety spots in a transverse row. The spines on its back are apparently poisonous as like all this set of caterpillars it can sting with them.

I failed to raise any of the moths of this caterpillar as they were too much injured in travelling. It is a very common animal and may often be seen on Soursop and other trees, but I have never seen it in large quantities. The simplest way of dealing with it is handpicking, but as the caterpillar defends itself with its poisonous thorns, it is necessary to remove or kill it with small sticks or pieces of bamboo. Caterpillars are easily wounded and a wound is invariably fatal so that they can be destroyed by merely spearing them with a sharp piece of bamboo. I cannot find that insecticides have been tried on this insect, but as it usually occurs in a somewhat scattered manner probably children could quickly destroy them in the manner suggested.

Some of the allied nettle grubs have done a great deal of harm in Tea estates in Ceylon and India. Mr. GREEN (Pests and Blights of the Tea plant) warns planters to look out for and destroy the preliminary broods to prevent there being a sudden increase in the pest, and suggests the use of arseniate of lead as an insecticide sprayed over the leaves. Of course planters will remember that this is poisonous and pepper fruit sprayed with it might be dangerous so that it should not be used when the pepper crop is nearly ripe.

Editor.

ON THE PREPARATION OF RUBBER.

An important paper with this title written by the well known expert Dr. C. O. WEBER appears in the *India Rubber Journal,* Feb. 15, 1904, p. 172. The paper deals with the latex of *Castilloa* on which Dr. WEBER has long been working but also more especially with that of Hevea of which he received large samples brought over in cold storage. He points out that the coagulation of latex in Castilloa is due to the coagulation of the albuminous matter in the latex. The India rubber substance is dissolved in the latex but is emulsified or suspended in it. So that when the albumen is coagulated it brings down with it the rubber. The coagulation depends very considerably on the exact nature of the albuminoid contained in the latex as well as the presence of certain inorganic salts. Hence two different kinds of latex of different botanical origin cannot be coagulated equally easily nor even per-

haps by the same means. Some can be coagulated by heat, others cannot. Most can be coagulated by either acetic or dilute mineral acid but all can be immediately coagulated by a solution of tannic acid, hydro-ferrocyanic acid or mercuric chloride or nitrate. Rubber thus coagulated contains all the albumen; the amount of which varies in different rubbers, thus Para rubber contains not more than 2–3 per cent. while coagulated Castilloa contains often as much as 4 per cent.

It is this albuminous matter in the rubber which produces "heating", due to the putrescence of the albuminoids. Rubber free from albumen never "heats" and this putrescence cannot occur if the rubber is perfectly dry. The incorporation of some antiseptic substance also prevents it. This latter is what is affected by the smoking of Para in the usual method, in which the acetic acid in the smoke probably acts as the coagulating agent the creosote and similar bodies act as antiseptics.

The comparative impurity of crude rubber stated as loss in washing or shrinkage by the manufacturer. These impurities which have lately decreased in African rubbers, but have been growing worse and worse in American and Eastern rubbers are mechanical impurities, earth, bark, &c. and resin and albuminoids.

The former are easily removed by straining. To remove the albuminoids Dr. WEBER recommends the following:—Add to every gallon of latex ½ oz. to 1 oz. of formaline (40 pc. solution) stir the latex and allow to stand one hour. Then add a solution of 1 lb. sodium sulphate in one pint of boiling water while hot and stir. Coagulation may take place immediately or after several hours standing. The sodium sulphate must be entirely neutral (not acid).

The cake is liable to contain numerous cavities including some of the molten liquor. It should therefore be washed on a corrugated rubber washing machine, then thoroughly dried in a dark, well ventilated shed. This rubber will be found to be free from every trace of albuminous matter and its only impurity will be the 2 pc. of resinous matter. Strictly speaking this rubber is not coagulated as the albuminous matter is removed but coalesced. The formaline combines with the albumen and forms a readily soluble solution. The sodium sulphate causes the rubber to rise to the top in a creamy mass and coalesce, and on working it on the washing rollers it rapidly acquires the great strength and toughness of high class rubber. Of coagulants Dr. WEBER mentions a number several of which would however, spoil the rubber. But he mentions four, *viz.*, formic acid, acetic and tannic acids, and phenol as more suitable. Of these tannic acid is the most energetic, but the rubber so prepared if wet and put into an incubator of 100° Fahr. putrifies. Formic acid and acetic are less energetic. The former is more expensive but less is required in the proportion of 3 to 4. It also has the advantage of possessing distinct antiseptic properties.

No more of the acids should be used than is absolutely required.

Para rubber contains in its native haunts 1·5 pc. albumen and one-third ounce of formic acid or half ounce of glacial acetic per gallon is sufficient to coagulate it.

In Castilloa double the quantity is required. The acid should be diluted with at least 1 pint of water.

The author recommends the use of a washing machine such as is used in rubber factories.

This is a short resumé of this valuable paper which is worth the attention of all rubber planters. It is illustrated with a few photographs, one of which is that of a remarkably fine Castilloa 2 years old in Mr. PEAR'S Estate at Muar.—*Editor.*

Rubber, Gutta-percha and Balata.

By FRANZ CLOUT.

An English Edition of this useful work has been published with additions and emendations. (Publishers—MACLAREN & SONS, 37 and 38, Shoe Lane, London). Price 12/6, Colonies 13/6.—*Ed.*

MISCELLANEOUS.

Notices to Subscribers.

I. For the information of subscribers and others who have been unable to complete their series of the Agricultural Bulletin of the Straits and Federated Malay States notice is here given that Nos. 1, 7, 8, 9, of the Old Series (1891–1900) and Nos. 1, 8, 9, 10, of the New Series Vol. 1 (1901–1902), the first issues of which have long been exhausted, are now being reprinted, with plates, and will shortly be ready.

II. Subscribers whose subscriptions are still unpaid are requested to send in their subscriptions for the present year as soon as possible. Members of the United Planters Association are requested to send in their subscriptions in future directly to the Editor and not to the Secretary of the Association.

II. Subscribers outside the Peninsula will in future be charged $3.50 per annum instead of $3 in order to cover postage.

Meteorological Observers are asked to send in their returns to the Editor, to arrive before the 10th day of the following month if possible, so as to be in time for going to press.

Wanted Nos. 8 & 9 of Vol. 1 (N. S.) of the Bulletin to complete the volume. Address F. B. Manson, Park View, Fytche Road, Rangoon.

Rainfall for February, 1904 :—

The Fort	...	Ins.	1-81
Government Hill	...	,,	4-35
The Prison	...	,,	2-02
Balek Pulau	...	,,	3-37
Pulau Jerajak	...	,,	2-23
Lumut	...	,,	4-23
Bruas	...	,,	6-85
Pangkor	...	,,	0-80

M. E. SCRIVEN,

Assistant Surgeon,

Penang, 10th March, 1904. *Prison Observatory.*

SINGAPORE MARKET REPORT.

February, 1904.

Articles.	Quantity sold.	Highest price.	Lowest price.
	Tons.	$	$
Coffee—Palembang	...	30.00	27.00
Bali	25	23.50	22.00
Liberian	163	23.50	18.50
Copra	1,792	8.65	7.50
Gambier	2,608	11.37½	10.15
Cube Gambier, Nos. 1 & 2	85	17.00	14.50
Gutta Percha, 1st quality	...	270.00	200.00
Medium	...	190.00	100.00
Lower	...	120.00	17.00
Borneo Rubber	...	145.00	90.00
Gutta Jelutong	...	8.25	7.25
Nutmegs, No. 110's	...	56.00	46.00
No. 80's	...	80.00	66.00
Mace, Banda	...	120.00	105.00
Amboyna	...	90.00	75.00
Pepper, Black	1,803	30.75	28.25
White	227	48.00	47.00
Pearl Sago, Small	25	5.90	5.25
Medium	...	...	...
Large	...	...	...
Sago Flour, No. 1	2,395	4.35	3.65
No. 2	235	1.60	1.25
Flake Tapioca, Small	548	5.00	4.70
Medium	8	...	...
Pearl Tapioca, Small	483	4.90	4.60
Medium	490	5.00	4.55
Bullet	...	...	...
Tin	2,000	78.00	74.25

(*A*)

Exports from Singapore and Penang to Europe and America.

For fortnight ending 15th February, 1904.

Wired at 12 noon on 16th February, 1904.

To England.

			Tons Steamer.
Tin	from Singapore & Penang	to England – and U. K. optional any ports.	1,780
Gambier	from Singapore	to London –	10
,,	,, ,,	,, Liverpool–	70
,,	,, ,,	to U. K. & / or Continent –	60
,,	,, ,,	to Glasgow –	...
Cube Gambier	,, ,,	,, England –	30
White Pepper	,, ,,	,, ,, –	110
Black ,,	,, ,,	,, ,, –	90
White Pepper	,, Penang	,, ,, –	30
Black ,,	,, ,,	,, ,, –	...
Pearl Sago	,, Singapore	,, ,, –	90
Sago Flour	,, ,,	,, London –	50
,, ,,	,, ,,	,, Liverpool–	775
,, ,,	,, ,,	,, Glasgow –	...
Tapioca, Flake	,, Singapore & Penang	to England	400
,, Pearl & Bullets	,, ,, ,,	,, ,, –	290
,, Flour	,, Penang	,, ,, –	550
Gutta Percha	,, Singapore	,, ,, –	100
Buff hides	,, ,,	,, ,, –	80
Pineapples	,, ,,	,, ,, cases	27,000

To America.

Tin	from Singapore & Penang –	1,356
Gambier	,, Singapore –	200
Cube gambier	,, ,, – – –	10
Black Pepper	,, ,, – – –	30
,,	,, Penang – – –	130
White Pepper	,, Singapore – – –	10
,,	,, Penang – – –	...
Nutmegs	,, Singapore & Penang – –	18
Tapioca, Flake & Pearl	,, ,, ,, – –	180
Pineapples	,, ,, – – cases	3,500

To the Continent.

Gambier	from Singapore	to South Continental Ports–	160
,,	,, ,,	,, North ,, –	80
Black Pepper	,, ,,	,, South ,, –	110
,,	,, ,,	,, North ,, –	20
Black Pepper	,, Penang	,, South ,, –	...
,,	,, ,,	,, North ,, –	...

			Tons Steamer.
White Pepper	from Singapore	to South Continental Ports	50
,,	,, ,,	,, North ,, -	40
,,	,, Penang	to South Continental Ports-	10
,,	,, ,,	,, North ,, -	...
Copra	,, Singapore & Penang	to Marseilles -	300
,,	,, ,,	,, Odessa -	820
,,	,, ,,	,, South Continental Ports - other than Marseilles and Odessa	200
,,	,, ,,	,, North Continental Ports -	1,450
Tin	,, ,,	,, Continent -	272
Tapioca Flake	,, ,,	,, ,, -	30
Tapioca Pearl	,, ,,	,, ,, -	40
Cube gambier	,, Singapore	,, ,, -	50
Pineapples	,,	,, ,,	cases 2,000
Sago Flour	,,	,, ,, -	875

N.B.—By "South Continental Ports" are to be understood all inside and by "North Continental Ports" all outside Gibraltar.

1,650 tons Gambier } contracted for during fortnight ending
1,150 ,, Black Pepper } as above.
(*in Singapore*)

Telegraphed to A. A. Niblett, Ingram House, 165, Fenchurch Street, London, E. C.

(*B*)

Exports from Singapore and Penang to Europe and America.

For fortnight ending 29th February, 1904.

Wired at 5.30 p.m. on 1st March, 1904.

To England:—

			Tons Steamer
Tin	from Singapore & Penang	to England - and U. K. optional any ports	1,151
Gambier	from Singapore	to London -	...
,,	,, ,,	to Liverpool-	...
,,	,, ,,	to U. K. & / or Continent -	120
,,	,, ,,	,, Glasgow -	...
Cube Gambier	,, ,,	,, England -	40
White Pepper	,, ,,	,, ,, -	120
Black ,,	,, ,,	,, ,, -	70
White ,,	,, Penang	,, ,, -	10
Black ,,	,, ,,	,, ,, -	...
Pearl Sago	,, Singapore	,, ,, ·	30
Sago Flour	,, ,,	,, London -	...
,,	,, ,,	,, Liverpool -	...
,,	,, ,,	,, Glasgow -	...

			Tons Steamer.
Tapioca, Flake	from S'gapore & P'nang	to England -	140
,, Pearl & Bullets	,, ,,	,, ,, ,, -	260
Tapioca Flour	,, Penang	to England -	100
Gutta Percha	,, Singapore	,, ,, -	...
Buff hides	,, ,,	,, ,, -	...
Pineapples	,, ,,	,, ,, cases	6,250
To America:—			
Tin	from Singapore & Penang	-	20
Gambier	,, ,,	-	20
Cube Gambier	,, ,,	-	...
Black Pepper	,, ,,	-	10
,,	,, Penang	-	...
White Pepper	,, Singapore	-	...
,,	,, Penang	-	...
Nutmegs	,, Singapore & Penang	-	...
Tapioca, Flake & Pearl	,, ,, ,,	-	10
Pineapples	,, ,, ,,	cases	150
To the Continent:—			
Gambier	from Singapore	to South Continental Ports	...
,,	,, ,,	,, North ,, -	480
Black Pepper	,, ,,	,, South ,, -	250
,,	,, ,,	,, North ,, -	150
,,	,, Penang	,, South ,, -	...
,,	,, ,,	,, North ,, -	...
White Pepper	,, Singapore	,, South ,, -	...
,,	,, ,,	,, North ,, -	30
,,	,, Penang	,, South ,, -	...
,,	,, ,,	,, North ,, -	10
Copra	,, Singapore & Penang	to Marseilles -	...
,,	,, ,,	,, Odessa -	1,000
,,	,, ,,	,, South Continental Ports- other than Marseilles and Odessa.	...
,,	,, ,,	,, North Continental Ports-	50
Tin	,, ,,	,, Continent -	140
Tapioca Flake	,, ,,	,, ,, -	40
Tapioca Pearl	from Singapore & Penang	to Continent -	250
Cube gambier	,, Singapore	,, ,, -	60
Pineapples	,, ,,	,, ,, cases	1,750
Sago Flour	,, ,,	,, ,, -	120

N. B.—By "South Continental Ports" are to be understood all inside and by "North Continental Ports" all outside Gibraltar.

800 tons Gambier
650 ,, Black Pepper *(in Singapore)* } contracted for during fortnight ending as above.

Telegraphed to A. A. Niblett, Ingram House, 165, Fenchurch Street, London, E. C.

Table showing the daily results of the reading of Meteorological Observations taken at the General Hospital, Seremban, for the month of January, 1904

Date.	Temperature of radiation. 9 H	15 H	Mean.	Maximum.	Minimum.	Range.	Temperature of radiation. Sun.	Difference sun and shade.	Grass.	Difference sun and shade.	Wind. Direction. 6 H	51 H	Temperature of evaporation. 9 H	15 H	Mean.	Computed vapour tension. 9 H	15 H	Mean.	Relative humidity. 9 H	15 H	Mean.	Clouds 0 to 10. 9 H	15 H	21 H	Cloud and weather initials. 9 H	15 H	21 H	Rain. Inches.
	°	°	°	°	°	°	°	°	°	°			°	°		in.	in.											
1	79	80	79.5	85	70	15	120	35	65	5	N.E.	E.	72.3	75	73.6	.793	.867	.830	80	85	82.5	1	5	0	B	C	B	.32
2	78	80	79	80	70	10	110	30	65	5	N.E.	E.	72.9	75	73.9	.810	.867	.838	84	85	84.5	2	2	0	B	B	B	
3	78	75	76.5	80	70	10	110	30	65	5	E.	N.E	72.9	75	73.9	.810	.868	.839	84	100	92	1	8	3	B	C	C	.98
4	78	71	78	85	70	15	120	35	65	5	N.E.	N.E	72.9	72.9	73.9	.810	.816	.810	84	84	84	2	3	10	B	C	R	.26
5	82	78	80	84	70	14	110	26	65	5	E	N.E	73.6	72.9	73.2	.830	.751	.820	76	84	80	2	3	10	B	C	R	1.53
6	82	84	83	85	70	15	120	35	65	5	E.	E.	73.6	70.7	72.1	.830	.751	.790	76	64	70	0	0	0	B	B	B	
7	82	84	83	88	70	18	140	62	65	5	E.	N.E.	70.3	70.7	70.5	.742	.751	.746	68	64	66	0	0	0	B	B	B	
8	82	84	83	86	70	16	130	44	65	5	N.E.	E.	70.3	70.7	70.5	.742	.751	.746	65	64	66	0	2	1	B	B	B	
9	82	84	83	88	70	18	140	62	65	5	N.E.	N.E.	70.3	70.7	70.5	.742	.742	.746	65	64	66	0	0	0	B	B	B	
10	82	82	82	87	70	17	130	43	65	5	N.E.	N.E.	70.3	70.3	70.5	.742	.826	.746	68	68	68	0	2	2	B	B	R	
11	82	85	83.5	88	70	18	140	52	65	5	N.E.	E.	71.6	73.4	71.8	.742	.868	.784	68	68	68	0	2	16	C	R	C	1.63
12	90	75	77.5	85	70	15	120	35	65	5	N.E.	E.	72.9	75	73.3	.775	.742	.871	75	100	87.5	0	3	10	C	B	C	.89
13	78	82	80	85	70	15	120	35	65	5	N.E.	E.	72.9	70.3	71.6	.816	.742	.771	84	68	76	3	2	3	C	B	C	
14	78	82	80	86	70	16	120	34	65	5	N.E.	N.E.	72.9	70.3	71.6	.810	.794	.776	84	68	76	3	2	5	B	B	B	.33
15	78	84	81	87	71	16	130	43	65	5	N.E.	E.	72.3	73.4	71.6	.810	.794	.802	84	68	76	2	0	2	B	B	B	
16	99	84	81.5	87	70	17	150	63	65	5	N.E.	E.	72.3	72.4	72.3	.793	.794	.793	80	68	74	1	0	2	B	B	B	
17	79	84	81.5	88	70	18	140	52	65	5	N.E.	E.	72.3	72.4	72.3	.793	.794	.793	80	68	74	0	0	2	B	B	B	
18	79	85	82	87	70	17	145	58	65	5	N.E.	E.	72.3	72.4	72.3	.793	.840	.793	80	68	74	0	1	2	B	B	B	
19	79	85	81.5	89	70	19	150	61	65	5	E.	E.	72.3	72.4	73.1	.793	.873	.816	80	72	76	0	3	0	B	B	B	
20	80	84	81.5	89	71	18	155	66	65	5	E.	E.	72.3	74	73.6	.793	.856	.833	80	72	76	6	0	0	B	B	B	
21	80	84	82	88	70	18	150	62	65	5	E.	E.	71.6	75	72.6	.751	.856	.815	75	80	77.5	0	0	0	B	B	B	
22	80	82	82	80	70	18	150	62	65	5	N.E.	E.	71.6	74.7	72.6	.775	.856	.815	75	80	77.5	0	0	0	B	B	B	
23	80	82	81	87	70	17	130	43	65	5	E.	E.	71.6	75.3	73.4	.775	877	.826	75	80	77.5	2	2	1	B	B	C	
24																												
25																												.48
26																												1.33
27	*																											.99
28																												
29																												.40
30																												.13
31																												

Total 8.91

* Not recorded

J. SHEPLEY PART, M.D.,
Acting State Surgeon.

Singapore.

Abstract of Meteorological Readings for the month of February, 1904.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum,	Range.	Mean Wet Bulb.	Vapour Tension.	Dew point.	Humidity.			
	Ins.	°F.	°F.	°F.	°F.	°F.	°F.	Ins.	°F	%		Ins.	Ins.
Kandang Kerbau Hospital Observatory	29·889	142·4	77·7	86·5	70·9	15·6	74·6	·783	72·4	78·0	N.E.	7·01	2·32

K. K. Hospital Observatory,
Singapore, 17th March, 1904.

A. B. LEICESTER,
Meteorological Observer.

D. K. McDOWELL
Principal Civil Medical Officer, S.S.

Penang.

Abstract of Meteorological Readings for February, 1904.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
	ins.	°F	°F	°F	°F	°F	°F	ins.	°F	%		ins.	ins.
Criminal Prison Observatory	29·878	144·2	80·1	88·9	73·8	15·1	75·1	·777	70·35	71	N.W.	2·02	1·03

Colonial Surgeon's Office,
Penang, 11th March, 1904.

M. E. SCRIVEN,
Asst. Surgeon.

T. C. MUGLISTON,
Colonial Surgeon, Penang.

Perak.

Abstract of Meteorological Readings for January, 1904.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
Taiping ...	...	151	78·82	89	68·5	20·5	75·21	827	...	84	...	22·34	2·55
Kuala Kangsar ...	...	...	78·48	89	68	21	74·48	802	...	82	...	11·68	4·65
Batu Gajah ...	...	159	78·72	90	70	20	74·66	805	...	82	...	17·49	2·74
Gopeng ...	...	...	78·26	89	63	26	75·03	825	...	85	...	13·44	2·90
Ipoh ...	...	...	78·06	90	71	19	74·42	805	...	83	...	12·76	1·95
Kampar ...	...	...	...	90	68	22	...	...	...	...	..	16·09	3·50
Teluk Anson ...	...	...	78·51	90	69	21	75·24	832	...	85	...	17·46	4·01
Tapah ...	...	...	78·71	90	65	25	75·32	834	...	85	...	23·57	3·57
Parit Buntar ...	...	...	79·20	88	69	19	75·66	840	...	84	...	10·44	2·65
Bagan Serai ...	...	...	79·13	88	70	18	75·32	828	...	83	...	11·33	2·81
Selama ...	...	...	79·83	89	70	19	76·04	848	...	84	...	15·35	2·43

State Surgeon's Office,
Taiping, 2nd March, 1904.

M. J. WRIGHT,
State Surgeon.

Perak.

Abstract of Meteorological Readings in the various Districts of the State, for February, 1904.

Districts.	Maximum in Sun.	Temperature.				Hygrometer.			Total Rainfall	Greatest rainfall during 24 hours.
		Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean wet Bulb.	Vapour Tension.	Humidity.		
Taiping ...	153	80·12	92	69.5	22.5	76·05	845	82	17·14	3·01
Kuala Kangsar ...	...	80·14	92	68	24	74·76	791	77	6·54	1·36
Batu Gajah ...	160	80·38	93	69	24	75·52	818	70	4·64	1·16
Gopeng ...	...	79·54	92	63	29	75·39	833	82	7·59	1·71
Ipoh ...	...	80·44	93	71	22	75·36	814	78	3·99	·81
Kampar ...	...	...	92	68	24	...	...	...	19·32	3·29
Teluk Anson ...	...	80·52	92	70	22	75·82	830	79	6·10	1·48
Tapah ...	..	79·74	92	67	25	75·30	819	80	12·18	2·19
Parit Buntar ...	...	80·46	90	69	21	76·44	857	82	3.01	1·22
Bagan Serai ...	...	80·50	91	69	22	75·76	827	79	3·81	·82
Selama ...	...	80.06	91	70	21	76·28	858	84	12·97	3·41

State Surgeon's Office,
Taiping, 16th March, 1904.

M. J. WRIGHT,
State Surgeon, Perak.

Selangor.

Abstract of Meteorological Readings in the various Districts of the State, for February, 1904.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature. Mean Dry Bulb.	Temperature. Maximum.	Temperature. Minimum.	Temperature. Range.	Hygrometer. Mean Wet Bulb.	Hygrometer. Vapour Tension.	Hygrometer. Dew Point.	Hygrometer. Humidity.	Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
General Hospital, Kuala Lumpur	29·886	151·8	79·9	89·1	67·4	21·7	76·1	0·831	73·5	80	Calm	3·22	1·10
Pudoh Goal Hospital ,, ...	...	...	...	...	...	...	...	...	...	...	...	5·34	2·15
District Hospital ,, ...	...	...	...	...	...	...	...	...	...	...	...	5·29	2·24
District Hospital Klang	...	...	...	84·3	72·4	11·9	...	...	...	...	...	2·76	0·68
,, Kuala Langat	...	...	...	85·8	69·9	15·9	...	...	...	...	...	2.84	1·32
,, Kajang	...	...	...	92·0	71·6	20·4	...	...	...	...	...	3·63	1·38
,, Kuala Selangor	...	...	...	84·9	72·8	12·1	...	...	...	...	...	0·96	0.38
,, Kuala Kubu	...	...	...	90·7	71·7	19·0	...	...	...	...	...	4·42	1·25
,, Serendah	...	...	...	89·3	76·1	13·2	...	...	...	...	...	8·31	2·36
,, Rawang	...	...	...	85·7	72·4	13·3	...	...	...	...	...	6·08	3·00
,, Hospital, Jeram	...	...	...	...	...	...	...	...	...	...	...	2·35	1·32
Ulu Gombak	...	...	...	...	...	...	...	...	...	...	...	4·40	1·40

State Surgeon's Office,
Kuala Lumpur, 14th March, 1904.

E. A. O. TRAVERS,
State Surgeon, Selangor.

Negri Sembilan.

Abstract of Meteorological Readings for the month of January, 1904.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
	Ins.	°F	°F	°F	°F	°F	°F	Ins.	°F	%		Ins.	Ins.
Seremban	...	...	...	...	...	...	...	...	...	...	...	8·91	1·63
Kuala Pilah	...	...	...	...	...	...	...	...	...	...	...	16·61	5·17
Tampin	...	...	...	...	...	...	...	...	...	...	...	7·91	3·40
Jelebu	...	...	...	...	...	...	...	...	...	...	...	10·01	4·90
Port Dickson	...	...	...	...	...	...	...	...	...	...	...	8·03	1·15

State Surgeon's Office,
Seremban, 4th March, 1904.

J. SHEPLEY PART, M.D.,
Acting State Surgeon.

Pahang.

Abstract of Meteorological Readings in the various Districts of the State, for February, 1903.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
Kuala Lipis, ...	...	...	...	92	68	18·7	...	...	...	...	...	2·81	1·05
Raub, ...	...	...	...	88	68	14·2	...	...	...	...	...	3·68	·98
Bentong ...	...	...	...	90	69	12·2	...	...	...	...	...	4·46	1·40
Pekan ...	...	...	...	86	66	11·6	...	...	...	...	...	4·20	3·33
Kuantan ...	...	...	...	86	66	20·0	...	...	...	...	...	3·74	1·85
Temerloh ...	...	...	...	89	70	19·0	...	...	...	...	S.W.	·52	·52

S. LUCY,
State Surgeon, Pahang

Kuala Lipis, 24th March, 1904.

Muar.

Abstract of Meteorological Readings for February, 1904.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew point.	Humidity.			
Lanadron Estate.	...	...	82·5	91	68·5	22·5	75·5	...	...	...	...	2·63	1·35

Muar, 12th March, 1904.

ROGER PEARS.

No. 4.] APRIL, 1904. [VOL. III. PART I.

AGRICULTURAL BULLETIN

OF THE

STRAITS

AND

FEDERATED MALAY STATES.

EDITED BY

H. N. RIDLEY, M. A., F. L. S.,

Director of Botanic Gardens, S. S.

CONTENTS.

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NOTICE.

The Scientific and Technical Departments of the Imperial Institute.

His Excellency the Governor has received a despatch from the Right Hon'ble the Secretary of State for the Colonies calling attention to the advantages offered by the Imperial Institute to Merchants, Planters and others, who may wish to have samples submitted to scientific experts for opinion as to their commercial value, &c. The following extracts from a Memorandum published by the Authorities of the Imperial Institute will give an idea of the work undertaken and carried on there.

"The Scientific and Technical Department of the Institute has "been established to acquire information by special enquiries and "by experimental research, technical trials and commercial valua-"tion regarding new or little known natural or manufactured pro-"ducts of the various Colonies and Dependencies of the British "Empire and of Foreign Countries, and also regarding known "products procurable from new sources, and local products of "manufacture which it is desired to export. This work is carried "out with a view to the creation of new openings in trade, or the "promotion of industrial developments."

2. In an extensive and well equipped series of Research Laboratories, a numerous staff of skilled chemists under the direction of Professor Wyndham R. Dunstan, M.A., F.R.S., carry out the investigation of the chemical constitution and properties of new dye-stuffs, tanning materials, seeds and food-stuffs, oils, gums and resins, fibres, timbers, medicinal plants and products, with a view to their commercial utilization. Whenever necessary these materials are submitted to special scientific experts, by whom they are made the subject of particular investigation or practical tests. Reports are also obtained from technical or trade experts in regard to the probable commercial or industrial value of any such products, while full information is collected from official or other trustworthy sources regarding the probable extent and cost of available supplies.

Reports on the results of enquiries or experimental investigations are supplied as a rule, without charge, but should special expenses be incurred in connection with any such reports, or with the commercial value of particular materials or manufactured products, which the Council do not consider themselves warranted in meeting, a statement of such outlays will be furnished, for repayment, when the Reports are supplied. Should an investigation or report of exceptional character be asked for by a Government Department, an estimate of the attendant expenses will be submitted, with a view to ascertain whether authority for such expenditure will be given.

AGRICULTURAL BULLETIN

OF THE

STRAITS

AND

FEDERATED MALAY STATES.

No. 4.] APRIL, 1904. [Vol. III. Part I.

PREPARATION OF CRUDE RUBBER.

By F. Pears.

Knowing the importance attached to the rubber industry as an agricultural product likely to be of great importance to the Malay Peninsula, I take the opportunity of addressing all those interested in its preparation. Holding that there can be no competition amongst rubber planters for the next twenty years at least, it must be in the interests of all to bring as much light as possible to bear upon the subject. At present there seems to be much diversity of opinion and many experiments going on which if they could in some way be concentrated would save a lot of unnecessary time and trouble. Smoking is even now advocated by some, although we know of many more efficient disinfecting ingredients, and as a drying medium, it singularly fails, as is proved by the quantity of moisture in "Para Fine" upon arrival in London.

To discuss this question logically we must start from the Trade requirements and ascertain what our customers require. First and foremost it is *uniformity*, the one point of vital interest and importance to the manufacturer. The necessity of uniformity in these days is apparent in many trades and therefore further comment would be useless. Unfortunately it will be many years before any one company or individual will be able to supply sufficient quantities of the raw material to establish a brand and get such good prices that uniformity with bulk would command. The only way to get over this difficulty would be for producers to agree to prepare their rubber in a certain way and ship it under one mark, the joint property of those interested. I am fully aware that there would be certain difficulties in organizing such a scheme, but still if the principle is agreed upon, it should be possible to arrange the details. I do not propose making any remarks as to these here as I am only confining myself to suggestions for the mutual benefit of all those interested in the production of raw rubber.

The question now arises as to what would be the best method of preparation and the only logical answer is, one containing as few impurities as possible, *i.e.*, absolute eradication of all the mechanical impurities and the removal of the organic impurities as far as prac-

ticable. To attempt anything less than this would be to court disaster as the amount of dirt and moisture could never be regulated in parcels of different origin. This is not the only reason why it would be advisable to prepare a rubber as pure as possible which an analysis would give say Rubber 98% and Resin 2%. To do this the freshly coagulated latex would have to be washed on a "rubber washing machine" and upon arrival could go straight into manufacture, *i.e.*, on to the mixing machines. Let us approximately see what the extra value would be on this product as compared with "Fine Para" @ 4*s.* 6*d.* This price of 4*s.* 6*d.* is for a product which loses 5 % in washing and then only contains 94% of rubber, and to bring it to this state of so-called purity, it has to be softened, washed and dried representing say seven days' work at a cost of about 6*d.* per lb. A simple calculation would bring a properly prepared rubber, as suggested above, up to a value of about 6*s.* Besides this there is of course the saving in freight to be taken into consideration which would be as much as 19%.

Will the manufacturers give us a proportionate advance for our ultra-fine material? Undoubtedly to start with they would not: firstly it would be something quite new and untested, and secondly there would not be sufficient quantities coming forward at first. It is equally certain that this anomaly would not last long and that after a time our produce would commend itself and once and for all disassociate itself from the jungle product, which could only be to our advantage.

Would washing the rubber add materially to its cost of preparation? I do not think it would; washing does not require much labour and the greater ease with which "washed sheeted rubber" can be dried would compensate us for the cost of the machine and labour. As a matter of fact it is almost impossible to dry biscuits unless very thin, as the outside hermetically seals them up making it impossible to dry the inside.

It is of course obvious that with dry rubber there can absolutely be no question of loss of weight in Europe.

Rubber prepared scientifically is capable of being kept for a considerable period without deterioration which at times may be most useful on a bad market.

I could enumerate many other points but neither space nor time are further at my disposal. Whatever one's opinions may be this is certainly a matter for discussion, it being of great importance to planters and I would suggest that, at the forthcoming Agricultural Show to be held in Kwala Lumpur next July, a meeting should be called of those interested in the production of crude rubber to thoroughly thrash this matter out as it is one of vital consequence to the future of the rubber industry in this country.

Before concluding I would like to make it quite clear that my suggestion as to uniformity in the preparation of rubber only refers to the treatment and has nothing whatsoever to do with its disposal.

F. PEARS.

IMPERIAL INSTITUTE, (SOUTH KENSINGTON, LONDON, S.W.)

REPORT ON GUTTA PERCHAS FROM THE STRAITS SETTLEMENTS.

By Professor WYNDHAM R. DUNSTAN, M. A., F. R. S., Director.

These samples of Gutta-perchas were forwarded to the Imperial Institute by Mr. CURTIS, the Assistant Superintendent of Forests, Penang, with a request that they should be examined in the Scientific and Technical Department for the purpose of ascertaining their chemical composition and commercial value (*see* letter dated April 4th, 1902).

The specimens received were as follows:—

1. Sample of Gutta-percha and about 50 lbs. of dried leaves of the species of Palaquium (*Palaquium pustulatum?*) known in the State of Perak as "Gutta Taban Putih".
2. Sample of "Gutta Simpor". (*Palaquium Maingayi*).
3. Sample of "Gutta Taban Chaia". (*Palaquium polyanthum?*).
4. Sample of "Gutta Minjato". (*Bassia sp?*) from Langkawi Islands.
5. Sample of "Gutta Susu". (*Dyera sp.*) from Langkawi Islands.
6. "Gutta Taban Merah" (*Palaquium gutta*) from Penang Forests.

The specimens Nos. 1, 2, 3 and 6 were collected under the supervision of European Forest Officers in order to ensure their authenticity, and they therefore represent the products of the different species of *Palaquium* without any admixture whatsoever.

Information was particularly desired concerning Nos. 1 to 5, and of these No. 1 Gutta Taban Putih, was stated to be the most important. This gutta is derived from a tree, probably *Palaquium pustulatum*, though its botanical identity is a little uncertain at present, this is the most abundant of the *Palaquiums* in the State of Perak and will grow at an elevation of over 2,000 feet. If the gutta-percha yielded by this species proved to be of good quality it was proposed to establish extensive plantations of the trees.

Numerous proposals have been made during recent years to extract the gutta-percha from the leaves of the *Palaquiums*, thereby obtaining an earlier yield from the plantations than would be possible otherwise, and several processes have been already patented for this purpose. A large sample of the dried leaves of the tree yielding the Gutta Taban Putih was therefore forwarded, so that experiments could be made to determine the amount and quality of the gutta-percha contained in them, and the feasibility of extracting it upon a commercial scale.

Description of the Samples.

No. 1—Gutta Taban Putih from *Palaquium pustulatum?*

The specimen was a conical mass which possessed a curious colour externally, varying from brown to bluish black, but when freshly cut it was almost white within. It was hard, very tenacious and contained very little foreign matter. On immersion in hot water it softened, becoming plastic but not sticky, and could be readily moulded, after which treatment it returned to its original condition on standing.

No. 2.—Gutta Simpor from *Palaquium Maingayi.*

This was a rounded cake, light brown externally, but whitish within which had a distinct cinnamon odour, and contained a small amount of foreign vegetable matter. It was hard in the mass but the inner portion were easily friable, whereas the outer layers were tougher and somewhat laminated; the greater part of the sample was easily reduced to coarse powder in a mortar. It became plastic but not sticky when immersed in hot water and the water acquired a slight yellow colour. After this treatment it hardened somewhat on standing but exhibited little tenacity, readily breaking when bent.

No. 3.—Gutta Taban Chaia from *Palaquium polyanthum?*

The specimen was a small rounded mass which was brown externally but much lighter within, and contained a small quantity of vegetable matter. It was hard in the mass and exhibited considerable tenacity; small pieces were slightly elastic and softened a little when held in the hand. When placed in hot water it behaved exactly like the preceding specimen, but exhibited much greater tenacity after cooling.

No. 4.—Gutta Minjato from *Bassia sp.?* from the Langkawi Islands.

The sample was a rectangular cake, dark brown externally but light brown within, which exhibited a laminated appearance when cut and contained a slight amount of vegetable matter. It was hard in the mass but fragments were easily friable, and it could be reduced to coarse powder in a mortar. When treated with hot water it formed a very soft sticky mass and communicated a slight yellow colour to the water. After this treatment it remained flexible for some time, but finally became hard and brittle, breaking readily with a short fracture.

No. 5.—Gutta Susu from *Dyera sp.* from the Langkawi Islands.

This was a flat rounded cake, dirty white externally but quite white within and almost entirely free from extraneous vegetable matter. It is probably identical with commercial Pontianac,* which it closely resembles in appearance. The sample was fairly hard in the mass but small pieces could be moulded in the fingers, becoming slightly sticky. On immersion in hot water it softened, becom-

ing quite plastic and rather sticky, and only hardened a little on standing.

No. 6.—Gutta Taban Merah from *Palaquium gutta*, from Penang Forests.

This was a rounded mass which presented a mottled appearance, the colour varying from light brown to nearly white. A fair amount of vegetable matter was present, chiefly small pieces of bark. The material was very hard and tenacious. It softened in hot water, becoming quite plastic but not at all sticky, and regained its original condition on standing.

Chemical Examination.

The samples were submitted to chemical examination in the Scientific and Technical Department of the Imperial Institute, and the results are given in the following table :—

* *Dyera costulata* (*Jelutong*).—*Ed.*

No.	Variety of Gutta Percha Native Name.	Botanical Source.	Moisture.	Gutta.	Resin.	Dirt and insoluble matter.	Ash included in dirt.	Gutta.	Resin.
			Per cent.	Per ct.	Per ct.	Per cent.	Per cent.		
1	Gutta Taban Putih	*Palaquium pustulatum* ...	7·5	35·6	49·5	7·4	0·72	Light-brown, strong.	White, hard.
2	Gutta Simpor ...	*Palaquium Maingayi* ...	1·2	44·9	45·5	8·4	2·13	Ltght-brown, strong.	White, hard.
3	Gutta Taban Chaia	*Palaquium polyanthum?* ...	1·2	52·0	43·4	3·4	1·61	Light-brown, rather better quality than Nos. 1 and 2.	Yellowish-brown, hard and translucent.
4	Gutta Minjato ...	*Bassia sp.?* ...	2·6	22·4	70·1	4·9	0·66	Light-brown, friable and somewhat waxy.	Yellowish-brown, hard and translucent.
5	Gutta Susu ...	*Dyera sp.?* ...	19·5	1·9	69·8	8·8	0·71	Contained no true gutta.	White, soft.
6	Gutta Taban Merah	*Palaquium gutta*	10·2	68·3	13·4	8·1	0·89	Light colour, strong, excellent quality.	Yellowish-white, soft.

For comparison, the percentages of gutta, resin and dirt have been calculated for the dry material as follows:—

No. 1. Gutta Taban Putih.	No. 2. Gutta Simpor.	No. 3. Gutta Taban Chaia.	No. 4. Gutta Minjato.	No. 5. Gutta Susu.	No. 6. Gutta Taban Merah.
Gutta 38·5.	45·5	52·6	23·0	2·4	76·0
Resin 53·5.	46·0	44·0	72·0	86·7	15·0
Dirt and Insoluble matter 8·0.	8·5	3·4	5·0	10·9	9·0
Ash (included in dirt) 0·77	2·16	1·64	0·7	0·9	1·0

These results show that the sample of Gutta Taban Merah, No. 6, which represents the highest class of gutta-percha, is of excellent quality, and far superior to any of the other specimens. The Gutta Taban Putih, No 1, contains a much higher percentage of resin and is therefore much inferior in quality to the preceding; the gutta which it contains is strong and of good quality however. Gutta Simpor, No. 2, is also an inferior grade of gutta-percha, owing to the presence of much resin, but here again the actual gutta is of good quality. The Gutta Taban Chaia, No. 3, is very similar material to Nos. 1 and 2, but contains a little less resin and its gutta is of rather better quality. The Gutta Minjato, No. 4, and Gutta Susu, No. 5, are not true gutta-perchas, since they contain no proper gutta. The "gutta" obtained from No. 4 was a friable and somewhat waxy substance, possessing little or no strength whilst No. 5 which resembles Pontianac, contained no gutta, but a quantity of rubber-like material, which was completely dissolved with the resin on treatment with ether. Neither of these samples could be utilised for insulating purposes.

For comparison with the foregoing results, some analyses by Dr. OBACH of similar samples of gutta-perchas of known botanical origin may be quoted.

Specimens of Gutta percha collected in Perak by Mr. Leonard Wray, Jun. and presented to the Royal Botanic Gardens, Kew in 1883-4.

(*Analysed in 1885.*)

Variety of Gutta Percha Native name.	Botanical Source given by Mr. Wray.	Appearance.	Water.	Gutta.	Resin.	Dirt.	Character of Gutta.	Character of Resin.
			Per ct.	Per ct.	Per ct.	Per ct.		
Gutta Taban Puteh (White.)	*Dichopsis polyantha* (Benth.)	White, clean.	1.0	47.0	48.4	3.6	Light-brown, elastic.	Light-brown, brittle.
Gutta Taban Simpor.	*Dichopsis Maingayi* (Clarke.)	Nearly white, clean, crumbly	1.2	23.1	71.5	4.2	Light-pinkish-brown, elastic.	Very light, hard.
Gutta Taban Chaier (liquid.)	*Dichopsis pustulata* (Hemsley.)	White, dense, clean.	1.7	45.3	49.6	3.4	Light brown, elastic.	Light brown, very brittle.
Gutta Taban Merah.	*Dichopsis Gutta* (Benth and Hook.)	Very light pinkish, clean.	1.4	77.1	16.9	4.6	Light-pinkish, elastic, prime.	Brown-Yellow, very hard.

A second and larger sample of Getah Taban Simpor from Dichopsis Maingayi was sent to Kew by Mr. WRAY in 1886. On analysis this was found to contain 31.2 per cent of gutta and 62.3 per cent of resin, and was therefore of better quality than the first specimen.

Specimen of Gutta Percha obtained by Dr. OBACH from Mr. H. N. RIDLEY in 1892.

Variety. *Getah Taban Merah.*		*Botanical Source.* *Dichopsis Gutta* (Benth.)			*Appearance.* Light Pinkish-brown, clean, dense.
Water.	Gutta.	Resin.	Dirt.	Character of gutta.	Character of resin.
13.1	66.7	14.0	6.2	Light, Pinkish, very strong.	Hard, reddish-brown, translucent.

The results of the chemical examination of the present series of samples are in general agreement with the previous analyses just given. The sample of Gutta Taban Putih analysed by Dr. OBACH was of rather better quality than that now under notice, whereas the present samples of Gutta Simpor and Gutta Taban Chaia are distinctly better than the earlier specimens. It will be noticed that the botanical sources of Gutta Taban Putih and Gutta Taban Chaia are transposed in the two series.

Commercial Valuation.

The samples were submitted for valuation and technical trial to manufacturers using large quantities of gutta percha, who reported that as the result of their examination, they valued the specimens as follows:—

No. 1 Gutta Taban Putih	...	2*s.* per lb.
No. 2 Gutta Simpor ...	...	1*s.* 6*d.* per lb.
No. 3 Gutta Taban Chaia	...	2*s.* 4*d.* per lb.
No. 4 Gutta Minjato	No use for insulating purposes.	
No. 5 Gutta Susu	do. do.	do.
No. 6 Gutta Taban Merah	...	6*s.* per lb.

The price of the last sample may be taken to represent the market value of the highest grade of gutta percha, subject to fluctuations, and it is therefore evident that Gutta Taban Putih of similar quality to the present specimen will only command one-third the price of this. It will be noticed too that a higher value is assigned to the Gutta Taban Chaia than to the Gutta Taban Putih. The Gutta Susu would fetch the market price of Pontianac.

Conclusions

This enquiry has therefore shown that the Gutta Taban Putih is very inferior in quality to the Gutta Taban Merah, and that it is only worth about one-third the price of the latter. No information has been furnished regarding the relative yields of gutta percha

obtained from the two trees in these experiments, but previous investigations upon this point seem to indicate that there is no great difference in this respect between the two species. If this be so the establishment of extensive plantations of the trees yielding Gutta Taban Putih could not be recommended in any locality where the much more valuable Taban Merah trees can be successfully grown, as there can be no doubt that the latter would give the best financial results. If the Taban Putih trees can be grown at higher altitudes than the other species, it would probably be advantageous to establish supplementary plantations of them in suitable districts. The trees yielding Gutta Taban Chaia may also be worthy of further experiments if they are suitable for cultivation in any districts where Taban Merah trees cannot be grown, since the gutta percha furnished by them appears to be slightly superior to the Gutta Taban Putih.

EXTRACTION OF GUTTA PERCHA FROM THE LEAVES.

About 50 lbs. of the dried leaves of the tree yielding Guttah Taban Putih (*Palaquium pustulatum?*) were forwarded so that experiments could be made to determine the amount of gutta percha they contain, and the possibility of extracting it upon a commercial scale. It may be noted at the outset, however, that the examination of the gutta perchas obtained from the trees has shown that Gutta Taban Putih is very much inferior in quality to Gutta Taban Merah, and this is also likely to be true in the case of the product from the leaves of the two trees. The problem of devising a suitable process for the extraction of gutta percha from leaves is a difficult one, which has not yet been satisfactorily solved and at this stage it would be desirable in any experiments upon the subject to employ the leaves of the tree furnishing the best quality of gutta percha.

The leaves were ground to coarse powder and were extracted in various ways by different solvents, with the result that they were found to contain about 2 per cent. of pure gutta, together with a large amount of resinous substance. The gutta thus obtained exhibited very good physical properties. Since the sample of Gutta Taban Putih derived from the tree contained only 35.6 per cent. of pure gutta, the above yield would indicate that the leaves contain 5.6 per cent. of gutta percha of similar quality to that yielded by the tree.

It is very probable, however, that the yield of gutta percha obtained from dry leaves in Europe is much lower than would be obtained from the same leaves by treatment on the spot. The gutta percha in the leaves is in a very finely divided condition and is therefore extremely liable to oxidation with the formation of resinous substances, so that owing to changes during transport, the quantity of gutta is likely to be considerably reduced. According to published statements on the subject, 9 or 10 per cent. of gutta percha can be

obtained from the leaves by extraction with solvents when the process is carried out on the spot.

The possibility of extracting gutta percha from the leaves has been the subject of many investigations during recent years, and numerous processes, many of which are protected by patents, have been already devised for the purpose. Most of those depend upon the extraction of the gutta percha by means of solvents, but others have been suggested in which the gutta percha is obtained by mechanical treatment. Several of the extraction processes have been tried upon a commercial scale in Europe, but for various reasons the results have been very unsatisfactory from a financial point of view, and it is believed that at the present time all the factories established in Europe have practically suspended operations.

It would appear from the results of these trials that in order to make any process a success it will be necessary to work it on the spot and that further experiments are required to determine the particular method most suited to the local conditions. Many of the processes which have been suggested involve the use of solvents of low boiling points, and would be very difficult to carry out in the tropics upon a large scale. From this point of view a mechanical process would be much preferable if one giving satisfactory results could be devised. It has been stated that the quality of the gutta percha obtained by mechanical methods is better than that prepared by the use of solvents, but the yield is said to be very much less. It would be well if this latter point could be definitely settled and experiments might be made to determine whether the yield could not be greatly increased by suitable treatment. A process depending upon the digestion and agitation of the crushed leaves with hot water in suitable machines may be suggested as one deserving experimental trial.

The gutta-percha in fresh leaves could possibly be readily separated by such treatment, and could be easily washed free from vegetable impurities. Machinery has been designed for extracting rubber from bark in this way, and is at present being used in the French Congo for the preparation of "root-rubber". If such a process, suitably modified, could be used for extracting gutta-percha from leaves, it would be much more preferable and cheaper than any method involving the use of solvents.

It is understood that several processes are at present undergoing practical trials in the East, and the results of these will afford some indication of their suitability for general use, and the possibility of their proving a financial success. It would probably be desirable to await the results of these trials before commencing operations upon a large scale in the Straits Settlements, and in the meantime to carry out some experiments upon mechanical processes as suggested above.

Another point which arises in connection with this subject is the possibility of obtaining regularly a sufficient supply of leaves to make the industry remunerative. It seems probable that, whatever process be adopted, it could only be successfully worked in con-

nection with extensive plantations of the trees, and even then it may be doubted whether it would be advantageous to pluck leaves from cultivated trees for the purpose of extracting the gutta-percha from them. This point, however, must be left for the consideration of the local authorities.

In view of the great superiority of Gutta Taban Merah over the other varieties of gutta-percha it would be desirable in any further experiments upon this subject to use the leaves of that tree, as they would in all probability furnish the best results.

REPORT ON RUBBER FROM THE STRAITS SETTLEMENTS.

A sample of Para Rubber, No. 7, was forwarded with the preceding specimens of gutta-percha for mechanical examination and valuation. It had been prepared from a tree growing in the Botanic Gardens, Penang, and consisted of three rectangular cakes 5 inches by 6 inches, and about one-eighth of an inch in thickness.

The rubber had a dark brown colour, was translucent and contained no visible impurities. One piece was slightly sticky but otherwise the sample exhibited very good physical properties.

On analysis it furnished the following results:—

Moisture ...	... 0·15	per cent.
Caoutchouc ...	...95·0	,,
Resin ...	... 4·3	,,
Ash ...	... 0·5	,,

The rubber was therefore of very good quality, and it compared very favourably with hard Para from South America, though the amount of resin was rather higher than is usually met with in the best qualities of the latter.

The brokers to whom it was submitted for commercial valuation reported that consignments of similar quality would realise the current market value of good Para Rubber.

WYNDHAM. R. DUNSTAN.

9th February, 1904.

Analysis of Castilloa and Funtumia Rubber.

Samples of Castilloa and Funtumia rubber were sent from Trinidad, by Mr. HART, the Superintendent of the Botanic Gardens, to the Imperial Institute where they were examined and analysed by Professor WYNDHAM R. DUNSTAN, of the Castilloa, rubber was taken from trees of four years old and also from old trees for comparison. The difference was very striking. That from the young trees showed very little resemblance to true rubber and possessed no elasticity and very little tenacity. It contained 64.1 of resin and only 33.6 Caoutchouc.

That from the old trees was good rubber and possessed all the requisite qualities. It contained 81.9 Caoutchouc, and only 15.8 Resin. The age of the old trees is not stated, but it is certainly clear that Castilloa trees cannot be tapped to any good purpose as young as four years and probably not for a good many years after that. It is pointed out that even in the old trees the amount of resin is far too high and much more than is permissible. Of the Funtumias, the samples were sent from *F. africana* and *F. elastica* for comparison. Reports from West Africa have stated that the former is inferior to the latter and this is confirmed by the analysis *F. africana* giving only 39·3 Caoutchouc to 60·00 Resin while *F. elastica* gave 60·4 Caoutchouc and 15·3 Resin.

Samples of *Castilloa* rubber and *Funtumia elastica*, of different ages were compared. The analyses show that while *Funtumia* for dry rubber at 4½ years 85·3–86·9 per cent. Caoutchouc and 11·2 and 10·0 Resin. *Castilloa* of the same age gave 41·3 to 44·4 Caoutchouc, and 49·3 to 56·2 Resin, so that Funtumia may be said to come into bearing much earlier than Castilloa. Castilloa trees 12 years old and over gave from 82·7 to 91·2 Caoutchouc, and 8·3 to 13·8 Resin.

The author of the report, however, points out that WEBER, in trees on the Isthmus of Columbia, of the ages of 4 and 5 years, found 26·47 and 18·18 per cent. resin, which is about half the amount in the Trinidad rubber.

The Funtumia and the Castilloa rubber from the older trees were valued at 2*s.* 2*d.* to 2*s.* 6*d.* per lb. for Funtumia and 2*s.* 4*d.* to 2*s.* 9*d.* for Castilloa.

Some Castilloa rubber prepared by Dr. WEBER'S process of adding Formaldehyde to the creamed latex, was found to have only 8·2 per cent. Resin and 91·2 Caoutchouc, and was a very satisfactory sample, but very similar to the best sample prepared by creaming and adding alcohol in the ordinary way, and was valued at the same price, *viz.* 2*s.* 9*d*. per lb.—(*Extracted from Bulletin Imperial Institute.*)

THE FUTURE OF RUBBER IN CEYLON.

Prices now and hereafter.

Although considerable activity is being shown in the planting of rubber in suitable districts in the island, the question of future prices introduces an element of uncertainty which hitherto, however, has not exercised a very restraining influence upon developments. It is well, however, to be prepared for all eventualities. To those of us who went through the hot fit of the cinchona craze, when acres of that product seemed more valuable to our dazzled eyes than the Witwatersrand, a modest estimate of future prices is popular, and acceptable. That those who have rubber trees capable

of being tapped during the next three or four years possess a very valuable adjunct to their tea or their coconuts goes without saying, but what we should all like to know is what range of prices are likely to be ruling, say, six years hence, when the rubber now being extensively planted in the Straits, in India, and in Ceylon, comes gradually into bearing. So far as one can see there is no likelihood of any great reduction in price. The demands of the markets of the world, even at the high prices now ruling, are ever on the increase, and so far have been almost entirely met by a supply of coarsely cured wild rubber. What we have, therefore, to consider is this—to what extent will supplies of cultivated rubber affect the market six and eight years hence when all the rubber now planted in British India and the Straits comes into bearing. Hitherto, no very reliable estimates have been framed as to the extent of the area now under rubber, but about 4,000,000 trees were supposed to be put out in Ceylon by the middle of last year. This is of itself no very large quantity, when it is remembered that the total consumption of the world is estimated at about cwts. 1,250,000. But, although that is a very large quantity of rubber, it is well to point out that it represents only 1 lb. per annum from 140,000,000 trees—or 2 lbs. per tree from 400,000 acres at 175 trees to the acre. This is a vast quantity, undoubtedly, but it is not so very overwhelming. Many, many years must elapse, no doubt, before anything like this quantity of rubber is produced from cultivated areas, but it is well to have the position brought into proper perspective. For some years to come no appreciable effect is likely to be produced upon prices by cultivated rubber, so far as we can see; but it is of course, only a question of time. With continued expansion of the area under this valuable product, the production will steadily increase, and tend hereafter to depress prices, and for this all careful men should be prepared. For ourselves we are inclined to think that the area in the island thoroughly suited for the production of Para rubber is not so unlimited as some people seem to imagine. Whether this be so or not we are still far from possessing an area under cultivation in rubber likely to influence prices adversely. But, with extensions in other parts of British India rapidly proceeding, the day must come when the markets of the world are affected. And this fact should not be lost sight of. The present price of 4*s*. and 5*s*. a lb. cannot last for ever, but there is this undoubted safeguard—that cultivated rubber, when available in any appreciable quantity, will always displace an equal amount of the uncultivated product. The latter costs much to collect, and any substantial fall in price would inevitably drive it out of the market at once, leaving space for vast supplies of the better prepared and purer product of British India and the Straits.

From the "Times of Ceylon."
Thursday, March 3rd, 1904.

COMMON TAPIOCA FLOUR.

By A. L. De Mornay.

The smaller Chinese growers, not having the sufficient capital to erect steam machinery to work off their crops, discovered a method some thirteen years ago, of producing an inferior Tapioca flour, or more correctly speaking meal, by means of rotting the tubers in water instead of disintegration, and thus avoiding the necessity of motive power.

It may interest some of your readers—especially those desirous of introducing a catch crop to work as a concomitant of the permanent cultivation of their Estates—to have a description of the process, which is as follows:—

A hole or shallow well of suitable size in proportion to the extent of crop to be treated, is dug in the ground at a spot of sufficiently low level to ensure the water remaining stagnant and not draining away. The hole is then charged full of unwashed tubers, care being taken that all are entirely submerged, and there left for 4 to 7 days. The time they take to rot depends to some extent on the weather (a low temperature retarding putrefaction) and partly on the degree of foulness the water may have reached according to the length of time the same hole may have been previously employed for the purpose. A new hole with pure water, taking a considerably longer time to accomplish putrefaction.

When it is found that decomposition is sufficiently advanced to mash the tubers to a pulp between the hand, they are removed from the hole and placed in a large tub into which a man enters and treads them out to as fine a pulp as possible.

A basket of about ¼ in. mesh is placed in a separate tub, and the pulp is poured into this and stirred till the greater part passes through the meshes of the basket, leaving only the woody and imperfectly rotted portions of the root. Water is frequently poured on the pulp to assist in straining the basket. When the desired quantity of pulp has thus been treated, the basket is withdrawn and the pulp left for 24 hours to precipitate. When it has settled, as well as its fibrous nature will permit of, the water is baled out of the tub and skimmed off the flour as much as possible.

Ordinary gunnies (sacks) are then tied to sticks driven into the ground in a triangular position, and the pulpy mass removed fro the tub and thrown into the sacks, where it is left to drain. I way the water drains out of the pulp, and becomes of consistency to be removed from the sacks, separated in and spread over a cement space to dry in the sun. W the lumps are broken smaller, and when comparatively den out and finally sifted through bamboo siev mesh, and packed for the market.

The proportion of so called "Flour" obtain may be calculated at 27 to 32 %.

A. L. De

COCONUTS.

If 1901 and 1902 were the most properous years the island has seen as regards prices realized for its Coconut products, the year 1903 has the pre-eminence of having exported the largest amount of all its products within the last ten years, and perhaps even before, Coconuts in the shell, alone being about two millions below the largest number ever exported. The figures are as follows:—Coconut oil cwts. 665,357; Copra cwts. 721,575 (cwts. 281,710 above the previous highest); Desiccated nuts 17,485,369 lbs., nuts in the shell 13,129,346; Rope cwt. 20,638; Yarn cwts. 92,124; Fibre cwts. 132,203. Your best customers have been the United Kingdom, America, Germany, and Russia. The United Kingdom took three fourths of the oil, and most of the yarn and fibre also 11 million pounds desiccated Coconuts and 9 millions of the Coconuts in shell. Germany is first in Copra and Poonac, and Belgium is a close second in Poonac. These two countries took cwts. 290,750, leaving only cwts. 9,222 for all other countries. Russia is a close second in Copra. America is second in desiccated Coconuts with close on 2 million pounds. America is also second in Coconut oil. As usual Singapore took almost all the rope, leaving only cwts. 301 out of 20,638. Prices from last year have dropped all round. Coconut oil from Rs. 15.60 to Rs. 13.50 per cwt. Copra from Rs. 52 to Rs. 46 per candy. Desiccated nuts from 18 cents to 15 cents per lb. Poonac from Rs. 80 to Rs. 70 per ton. Prices however keep well above those ruling four or five years ago, and may be considered satisfactory in the face of the large increase in output in the different products. The manufacture of Coconut Butter is reported to be well under way, and it is hoped the enterprise will be successful. Your Committee has not learned that many are cultivating the sensitive plant as a nitrogen producer; land owners are on the look-out for some plant less objectionable. A modification of the Malay States Ordinance for the protection of Coconut from the ravages of the red-beetle might with advantage be introduced locally, the black-beetle is in Ceylon practically harmless. The weather as a rule has been favourable and an average yield may be expected. It is useless to try and forecast prices.

(*Extracted from the 50th annual report of the Planters' Association of Ceylon*).

RAMIE.

25, Birchington Road,
West Hampstead, N. W.

Esq., *London, February 20th, 1904.*

to High Commissioner,

ed Malay States.

thank you for Agricultural Bulletin No. 11

ver all the points as they occur to me as I read

starting from page 356. There is much truth in the contentions of the London Correspondent to Pioneer and he has erred in so far he has *understated* the case. I must respectfully differ with the Editor's note on page 359, and I would ask you to read enclosed cutting from the Draper Textile Mercury Magazine of Commerce. It is absurd to expect buyers to contract till they know what the planter can produce. The planter is afraid to experiment. It is in his power to start cautiously if he will and prove his produce can be used but he cannot expect Costly Machinery to be fitted here in the hope he will at some future time feed it. There are more mills now than the Indian Crops can supply. This is proved by the high prices obtained for Raw Material. I note Mr. BAXENDALE tries retting and expects same result with Ramie from Flax methods. Treat Ramie as it should be not as one does other fibres. Filasse Ramie on the plantation. Till this is done all the disappointments mentioned by Mr. BAXENDALE will continue. First there is the loss in freight and not least the greater difficulty and expense in treating Ribbons. Why not produce as the Chinese do if your planter won't filasse, but I expect the ribbons were brown "Rhea" ribbons as they are known by here and though I can treat them, I must admit the China supplies yield better results. But even brown ribbons would find a regular market and if Mr. BAXENDALE will guarantee regular supplies I can assure him a demand. I note Mr. BAXENDALE thinks it is the spinner who has to be converted. Let me assure him the trade are anxious for supplies but cannot get planters to guarantee supplies. No mill can work with intermittent feeding, the quantity and quality must be regular. Mr. BAXENDALE's idea of the quantity used in incandescent gas mantle is quite misleading, I know factories that have orders booked 6 months ahead. If your planters are prepared to supply one thousand tons per week I am able to find them customers. What produce does Mr. BAXENDALE refer to, as far as I can gather he has 400,000 plants, how far could that go towards keeping a mill employed, but even that small amount if sent regularly will be taken. Mr. BAXENDALE talks of small farmers wanting hydraulic presses, &c., as well as talk of farmers establishing mills to grind a few acres of corn. When the growers are there then the middle man will be there to collect filasse bale &c., &c. As to not recommending the Government to take the matter up, this rests with your Colony, but you will find to your cost the trade will be captured by others; already the German Government are subsidising their African Colonies and encouraging Ramie production, and the French are capturing the Indian planters for the supplies now being grown in India are for French markets. Mr. BAXENDALE's results should suffice to convince any one. £18 13*s*. 4*d*. per acre what other crop produces it. I would suggest you print and circulate the Article I send you from the Draper. All the proof you want is obtainable. It is quite true a very different state of things exists now than when Mr. BAXENDALE was here. How is it the Japs and Chinese do so well with Ramie. That should suffice to prove there's an Industry lurking at your door. Once Ramie takes

the place it deserves there will be no more Cotton famines, cornering, gambling and the like curses.

To conclude if you will appoint an agent here to investigate the possibilities I am prepared to convince him, and Mr. BAXENDALE will deserve well of his shareholders if they start the Ramie industry. Please reprint this and circulate it as you have kindly done my other letters and may I suggest you appoint a Committee to investigate the possibility of starting the industry on Commercial lines I have offered my service on "the cure no pay" terms. I repeat Floreat Ramie.

Yours, &c.,

D. EDWARDS RADCLIFFE.

Please send a copy of this to Mr. BAXENDALE Cuttings per same post.

JUGRA ESTATE,
Selangor, April 9th, 1904.

In reply to Mr. EDWARDS-RADCLIFFE'S letter of February 20th, 1904, to Secretary to High Commissioner, I beg to make the following observations:—

2. Ramie spinners have frequently told me that they *have* costly machinery fitted up out when I produced my China Grass (produced by Faure machine) the best quotation was £17 a ton. This allowing for a reasonable loss in degumming works out to less than half the value of the best cotton.

3. Mr. RADCLIFFE says he can treat brown ribbons. The Company with which he was associated in 1900 said the same thing and did, I believe, filasse and spin one bale which was highly reported on but the treatment of brown ribbon appeared to become a lost art, for when we offered them several bales as a present they replied that the stuff was useless to them.

4. I did not say I "expected" success when I tried Flax methods, as I was fully aware at the time that every similar experiment had failed. I did it at the earnest request of a friend who was interested in flax spinning. If I was to blame for wasting my time over this, I was equally to blame for producing Ramie in any shape or form as up to the time I started no case had been recorded of any European planter making a success of it.

5. I do not see that my remarks anent gas mantles are necessarily misleading because Mr. RADCLIFFE knows factories with orders booked 6 months ahead. I have heard that there are mills in England which think 2 tons a month quite a large order.

6. I grant that 400,000 plants compare poorly with the magnificent acreage we read about in story books written by Company promoters; but in real life it took time and cost a good deal of money to get them together; and, at any rate, a small fraction of

their produce seemed to be more than enough to meet the requirements of Mr. RADCLIFFE'S friends.

7. In using my figures, apparently as an argument to persuade the planter to shut his eyes, open his mouth and see what the spinner will put into it, Mr. RADCLIFFE quotes the hypothetical value of an acre's production, *i.e.* £18 13*s.* 4*d.* and naively asks "what other crop produces it"? He has failed to notice the little items of expenditure that must be set against it.

8. I question if it would pay to open land for Ramie only in this country—even assuming that degummers are willing to buy it on the spot at the rate of four pence a pound for the resultant filasse. Until the Ramie spinner backs his oft-expressed opinion that it is equal (if not superior) to flax, by offering a similar price for it, the "King of Fibres" is doomed to the humble position (at best) of a supplementary product or catch crop.

9. Chinese methods of production might be adopted by our natives, were it not for the fact that the Malay can earn enough in a day to keep himself for a week, by other occupation.

10. While I still retain the highest opinion of the potentialities of Ramie fibre and believe it will ultimately revolutionise the textile industry, I cannot recommend the Government to fritter away public funds in any experimental work, until evidence is forthcoming that Ramie spinners are prepared to take a practical interest in the venture.

CYRIL E. S. BAXENDALE.

JUGRA ESTATE,
April 9th, 1904.

VANILLIN.

IMPERIAL INSTITUTE,
(*South Kensington, London, S. W.*)

Memorandum on the Manufacture and Production of Vanillin and its employment as a substitute for Vanilla.

Vanillin is the constituent to which Vanilla owes its aroma and flavour. It was discovered in 1858 by COBLEY, and was subsequently investigated by a number of chemists, notably by TIEMAN, who first prepared it artificially from Coniferin, a glucoside found in certain coniferous plants. Since that time a large number of processes for the artificial preparation of Vanillin on a commercial scale have been devised. The first of these to meet with commercial success was that of DE LAIRE (English Patents: 1890 No. 17,547: 1891 No. 17,137), who used as a starting point *eugenol*, the substance to which oil of cloves owes its characteristic odour. DE LAIRE'S process, either in its original form or slightly modified, was worked in France by DE LAIRE & Co., and in Germany by

BAARMANN and REIMER during the period 1891-1896 apparently under an agreement to avoid competition in prices. About 1897, however, a period of competition set in between the French and German makes, which was further accentuated by additions, in France, Germany and Switzerland, to the number of firms making vanillin. The result has been that the price of this product, which was £9 per lb. in 1890, has steadily fallen until in November last it was quoted at £1.1.4 per lb. It is probable that all the vanillin so far placed on the market has been made from *eugenol*, and its price has therefore been governed by that of oil of cloves as the raw product. In 1901, however, a patent (No. 310,983) was taken out in France by VIGNE, in which an electrolytic method for the preparation of vanillin from sugar was described. If the claims of the inventor are borne out by practical trials on an industrial scale, it is probable that a further reduction in price may be expected, owing to the great difference in cost of the two raw products *eugenol* and sugar.

There is no trustworthy information as to the extent to which artificial vanillin is manufactured and used at the present time, but to judge from the number of firms engaged in its production the amount must be considerable.

As regards the effect of the manufacture and sale of "artificial vanillin" upon the demand for vanilla, it is remarkable that this has up to the present been comparatively slight. When it is considered that vanilla is employed principally as a flavouring agent, and that its value in this respect depends upon the amount of vanillin it contains, it is curious that so recently as November last good qualities of vanilla should be saleable at 17/- to 19/6*d*. per lb. whilst the equivalent amount of artificial vanillin for flavouring purposes, could be obtained for about one-thirtieth of this cost. It it probable that this preference for Vanilla over artificial Vanillin is due partly to conservatism on the part of the consumers, and partly also to a somewhat widespread belief that vanillin does not wholly represent the flavour of vanilla, which it is alleged is partly due to minute quantities of other aromatic substances present in the plant. Some evidence in favour of this view is furnished by the statements made at various times by chemists who have examined particular varieties of Vanilla, and have isolated in addition to Vanillin small quantities of heliotropin, benzoic acid, etc. These substances are however both cheap and readily obtainable, and if necessity arose it would be a very easy matter to mix them in a proper proportion with vanillin, in order to modify the flavour of the latter in the required direction.

The foregoing statement of the present condition of vanillin manufacture indicates clearly the possibility in the near future of the replacement of vanilla as a flavouring agent by vanillin.

It is difficult to obtain reliable statistics of the production of vanilla since the cultivation of this product is so widely distributed in tropical countries, and the imports of it into the principal consuming countries are comparatively of so little value that they are

rarely separately given. The United States Trade Returns for 1902, however, give a table of the imports of Vanilla into that country for the decennial period ending in 1902, of which an abstract is given below.

Imports of Vanilla into the United States of America.

	Weights lbs.	Value.	Average Value per lb.
		$	$
1894	171,856	727,853	4.2
1896	235,763	1,013,608	4.2
1899	272,174	1,235,412	4.5
1900	225,966	1,209,334	4.7
1901	248,988	875,229	3.5
1902	361,739	859,399	2.3

These figures show that although there is at present no falling off in the demand for Vanilla, there has been a great decline in value.

The same state of things is shewn by the results of the two auctions held in London in February and November of the present year. At the former, 2,800 tins were sold and at the latter 1,410 tins. These quantities are in excess of those of former years. The prices obtained in February ranged from 22/6*d.* per lb. for best qualities to 14/6*d.* for somewhat short chocolate coloured beans, and 7/6 to 11/6*d* for "foxy brown" beans. In November the best qualities realised only 17/ to 19/6*d* per lb. short beans from 8/6*d* to 11/ and poor qualities 4/ to 7/ per lb.

It is almost impossible to give accurately the total annual production of Vanilla at the present time, but it may be estimated at about 250 tons, of which about 150 tons are produced in the British Colonies and Bourbon, and the remainder in Mexico. Such statistics as are available indicate that the total production has remained almost stationary during the last few years, the increased out-put from Seychelles and Mexico being compensated by small exports from Mauritius and Bourbon. This being the case it is evident that the depreciation in value of Vanilla must be ascribed almost entirely to the competition of Vanillin as a flavouring agent. In this connection it is desirable that it should be known that the so-called "Artificial Vanillin" is identical in every respect with the Vanillin contained in Vanilla, and to which the flavour of the plant is chiefly if not entirely due. For this reason it is not possible to encourage proposals to prevent the sale of Vanillin as a "substitute" for Vanilla.

WYNDHAM R. DUNSTAN.

29th December, 1903.

Notes from the India-Rubber Journal.

The International Rubber Planters Association.—The Editor of the Journal publishes a letter from Sir WILLIAM THISELTON DYER accepting the position of President of the Association. Sir WILLIAM has always taken the greatest interest in the cultivation of Rubber and indeed it is to him that we in the East are indebted for the introduction of the Para rubber tree into the East. Dr. WEBER is the Honorary Expert of the Association. The Editor suggests to members of the Association, that they should prepare 5lb. samples of rubber in any way that seems to them best or by any method to which they are best accustomed. Details of the process used should be given, and the samples will be examined by a prominent broker, then by a buyer, then by Dr. WEBER. A portion of each will be analysed, after which they will be sent to an expert manufacturer who will give his opinion on their merits and who will then proceed to manufacture each sample separately. A report of their behavior after vulcanisation will be given, a microscopic examination will follow and a general report on the value of each sample will be given. This system should produce the most valuable results, and one would certainly think that members of the Association would not delay to send samples in for so valuable an examination and criticism.

Mr. SIDNEY PARRY writes a descriptive letter about Rubber planting in the Peninsula illustrated by good photographs of Para trees in Kajang, 3½ and 6½ years old and trees on Kent Estate.

Editor.

Minutes of the first meeting of the General Committee, held at the Selangor Club at 11 a.m. on Saturday, the 26th of March.

The Acting Resident presided, there being 33 members present out of a total of 42.

2. The Chairman in a brief address informed the meeting of the objects of the show, remarking that this was the first of a series of shows which it had been decided to hold annually through the Colony and the Federated Malay States: that agriculture was a subject in which the Resident-General takes a great deal of interest and concluding by expressing the hope that those gentlemen who had been so good as to consent to serve on the various Committees, would do their best to make the show a success

3. The agenda was then read by the Chairman of the Local Standing Committee (Mr. W. W. BAILEY), and it was decided to deal with the fifth item on the agenda first, viz—: "To consider suggestions made by the Local Standing Committee."

4. The following suggestions were agreed to *nem. con.* :—

(1) That the show be held on the race course,—subject to the approval of the Turf Club;

(2) That the date of the show shall be about the end of July, but not on such a date as will interfere with the race meeting.

(3) That the show shall remain open three days.

5. Suggestion 5, viz—: "that subscribers of five dollars and upwards, be entitled to complimentary tickets" was, on the motion of the Chairman, amended so as to read "subscribers of ten dollars and upwards shall be entitled to complimentary tickets". This was agreed to unanimously.

6. Suggestions 4 and 6 relating to the prices of admission, and time of opening the show respectively, were on the motion of Mr. SEVERN, referred to the General Purposes Committee.

7. It was proposed by Mr. PARKINSON and seconded by Mr. PRIOR that Mr. STANLEY ARDEN be appointed General Secretary. Carried.

8. On the motion of Mr. PRIOR, seconded by Mr. W. W. BAILEY, Mr. H. C. E. ZACHARIAS was unanimously elected to the post of Hon: Treasurer.

9. A discussion on the subject of raising additional funds followed, and a motion of Mr. SEVERN "that a subscription list be opened and that Government be asked to subscribe dollar for dollar of the amount subscribed", failing to find a seconder, Mr. BAILEY proposed "that in addition to the sum already provided in the estimates, viz: 2,000 dollars, Government be invited to give dollar for dollar of the amount raised by private subscription". This was seconded by Mr. H. F. BROWELL and carried by a large majority.

10. It was unanimously agreed that the collection of private subscriptions should be left in the hands of the General Purposes Committee.

11. Mr. PRIOR proposed and Mr. SKINNER seconded "that the cost of transport of exhibits approved by any member of the Committee shall be paid for by the Committee". Carried unanimously.

12. The General Secretary submitted to the meeting a draft list of rules and regulations relating to exhibits. These were agreed to '*in toto*', but referred to the General Purposes Committee for consideration.

13. On the motion of Mr. BAILEY it was agreed that each sub-committee should appoint their own Judges.

14. The General Secretary was instructed to approach the Federal Government, with a view to making arrangements for the attendance at the show, of Messrs. RIDLEY and DERRY of the Singapore Botanic Gardens, and Mr. FOX of the Botanic Gardens, Penang.

15. The next meeting of the General Committee having been fixed for Saturday, the 16th April.

The meeting terminated at 12 20. P.M. with a vote of thanks to the Chairman.

MISCELLANEOUS.

Notices to Subscribers.

I. For the information of subscribers and others who have been unable to complete their series of the Agricultural Bulletin of the Straits and Federated Malay States notice is here given that Nos. 1, 7, 8, 9, of the Old Series (1891–1900) and Nos. 1, 8, 9, 10, of the New Series Vol. 1 (1901–1902), the first issues of which have long been exhausted, are now being reprinted, with plates, and will shortly be ready.

II. Subscribers whose subscriptions are still unpaid are requested to send in their subscriptions for the present year as soon as possible. Members of the United Planters Association are requested to send in their subscriptions in future directly to the Editor and not to the Secretary of the Association.

II. Subscribers outside the Peninsula will in future be charged $3.50 per annum instead of $3 in order to cover postage.

Meteorological Observers are asked to send in their returns to the Editor, to arrive before the 10th day of the following month if possible, so as to be in time for going to press.

Wanted Nos. 8 & 9 of Vol. 1 (N. S.) of the Bulletin to complete the volume. Address F. B. Manson, Park View, Fytche Road, Rangoon.

Rainfall for March, 1904:—

The Prison	...	Ins.	3-88
Government Hill	...	,,	3-88
The Fort	...	,,	2-69
Balik Pulau	...	,,	2-03
Pulau Jerajak	...	,,	2-99
Bruas	...	,,	4-24
Pangkor	...	,,	1-00
Lumut	...	,,	1-63

M. E. SCRIVEN,

Assistant Surgeon,

Penang, 8th April, 1904. *Prison Observatory.*

SINGAPORE MARKET REPORT.

March, 1904.

Articles.	Quantity sold.	Highest price.	Lowest price.
	Tons.	$	$
Coffee—Palembang	13	26.00	25.00
Bali	5	22.00	21.50
Liberian	293	18.75	17.50
Copra	1,758	8.40	7.00
Gambier	1,055	10.87½	10.25
Cube Gambier, Nos. 1 & 2	330	16.50	14.50
Gutta Percha, 1st quality	...	270.00	200.00
Medium	...	190.00	100.00
Lower	...	120.00	17.00
Borneo Rubber	...	140.00	85.00
Gutta Jelutong	...	8.25	6.75
Nutmegs, No. 110's	...	45.00	42.00
No. 80's	...	65.00	62.00
Mace, Banda	...	95.00	85.00
Amboyna	...	70.00	65.00
Pepper, Black	705	29.75	28.00
White	121	48.00	47.50
Pearl Sago, Small	140	6.00	5.00
Medium	15	...	...
Large	...	...	...
Sago Flour, No. 1	2,836	3.75	3.35½
No. 2	840	1.30	1.10
Flake Tapioca, Small	442	4.75	4.60
Medium	67	5.25	...
Pearl Tapioca, Small	417	4.70	4.55
Medium	432	4.90	4.45
Bullet	...	...	...
Tin	1,480	80.75	74.50

(A)

Exports from Singapore and Penang to Europe and America.

For fortnight ending 15th March, 1904.

Wired at 3.45 p.m. on 16th March, 1904.

		Tons Steamer.
To England.		
Tin	from Singapore & Penang to England and U. K. optional any ports. -	1,821
Gambier	from Singapore to London -	...
,,	,, ,, ,, Liverpool-	510
,,	,, ,, to U. K. & / or Continent -	330
,,	,, ,, to Glasgow -	...
Cube Gambier	,, ,, ,, England -	50
White Pepper	,, ,, ,, ,, -	20
Black ,,	,, ,, ,, ,, -	370
White Pepper	,, Penang ,, ,, -	...
Black ,,	,, ,, ,, ,, -	50
Pearl Sago	,, Singapore ,, ,, -	80
Sago Flour	,, ,, ,, London -	...
,, ,,	,, ,, ,, Liverpool-	1,400
,, ,,	,, ,, ,, Glasgow -	...
Tapioca, Flake	,, Singapore & Penang to England	380
,, Pearl & Bullets	,, ,, ,, ,, ,, -	360
,, Flour	,, Penang ,, ,, -	750
Gutta Percha	,, Singapore ,, ,, -	20
Buff hides	,, ,, ,, ,, -	130
Pineapples	,, ,, ,, ,, cases	26,000
To America.		
Tin	from Singapore & Penang -	635
Gambier	,, Singapore -	20
Cube gambier	,, ,, - - -	...
Black Pepper	,, ,, - - -	30
,,	,, Penang - - -	...
White Pepper	,, Singapore - - -	10
,,	,, Penang - - -	...
Nutmegs	,, Singapore & Penang - -	6
Tapioca, Flake & Pearl	,, ,, ,, - -	40
Pineapples	,, ,, - - cases	1,000
To the Continent.		
Gambier	from Singapore to South Continental Ports-	180
,,	,, ,, ,, North ,, -	300
Black Pepper	,, ,, ,, South ,, -	230
,,	,, ,, ,, North ,, -	340
Black Pepper	,, Penang ,, South ,, -	...
,,	,, ,, ,, North ,, -	...
White Pepper	from Singapore to South Continental Ports	50
,,	,, ,, ,, North ,, -	30
,,	,, Penang to South Continental Ports -	...
,,	,, ,, ,, North ,, -	40

				Tons Steamer.
Copra	from Singapore & Penang	to Marseilles	-	540
,,	,, ,,	,, Odessa	-	...
,,	,, ,,	,, South Continental Ports (other than Marseilles and Odessa)	-	440
,,	,, ,,	,, North Continental Ports	-	1,000
Tin	,, ,,	,, Continent	-	178
Tapioca Flake	,, ,,	,, ,,	-	80
Tapioca Pearl	,, ,,	,, ,,	-	440
Cube gambier	,, Singapore	,, ,,	-	220
Pineapples	,,	,, ,,	cases	3,500
Sago Flour	,,	,, ,,	-	1,500

N.B.—By "South Continental Ports" are to be understood all inside and by "North Continental Ports" all outside Gibraltar.

1,050 tons Gambier
580 ,, Black Pepper
(*in Singapore*)
} contracted for during fortnight ending as above.

Telegraphed to A. A. Niblett, Ingram House, 165, Fenchurch Street, London, E. C.

Export Telegram to Europe and America.

For Fortnight ending 31st March, 1904.

Wired at 1 p. m. on 1st April, 1904.

		Str.			Tons.
10	Tin	Str.	Singapore & Penang	United Kingdom &/or	551
11	Do	,,	,,	U. S. A.	5
12	Do	,,	,,	Continent	286
13	Gambier	,,	Singapore	London	20
14	Do	,,	,,	Liverpool	...
15	Do	,,	,,	U. K. &/or Continent	330
16	Cube Gambier	,,	,,	United Kingdom	50
17	Black Pepper	,,	,,	,,	160
18	Do	,,	Penang	,,	160
19	White Pepper	,,	Singapore	,,	50
20	Do	,,	Penang	,,	20
21	Pearl Sago	,,	Singapore	,,	60
22	Sago Flour	,,	,,	London	200
23	Do	,,	,,	Liverpool	...
24	Tapioca, Flake	,,	Singapore & Penang	United Kingdom	300
25	Do Pearl	,,	,,	,,	220
26	Do Flour	,,	Penang	,,	725
27	Gutta Percha	,,	Singapore	,,	30
28	Copra	,,	Singapore & Penang	,,	...
29	Buffalo Hides	,,	Singapore	,,	10
30	Pineapples	,,	,,	,,	cases 15,000
31	Gambier	,,	Singapore	U. S. A.	...
32	Cube Gambier	,,	,,	,,	...
33	Black Pepper	,,	,,	,,	...
34	White Pepper	,,	,,	,,	...
35	Black Pepper	,,	Penang	,,	...
36	White Pepper	,,	,,	,,	...
37	Nutmegs	,,	Singapore & Penang	,,	1
38	Flake & Pearl	,,	,,	,,	...
39	Pineapples	,,	Singapore	,,	...
40	Do	,,	,,	Continent	cases 2,000
41	Gambier	,,	,,	S. Continent	70
42	Do	,,	,,	N. Continent	80
43	Cube Gambier	,,	,,	Continent	50
44	Tapioca Flake	,,	Singapore & Penang	,,	40
45	Tapioca Pearl	,,	,,	,,	100
46	Copra	,,	,,	Marseilles	...
47	Do	,,	,,	Odessa	...
48	Do	,,	,,	S. Continent	200
49	Do	,,	,,	N. Continent	100
50	Black Pepper	,,	Singapore	S. Continent	...
51	Do	,,	,,	N. Continent	60
52	White Pepper	,,	,,	S. Continent	...
53	Do	,,	,,	N. Continent	80
54	Do	,,	Penang	S. Continent	...
55	Do	,,	,,	N. Continent	20
56	Black Pepper	,,	,,	S. Continent	...
57	Do	,,	,,	N. Continent	...
58	Sago Flour	,,	Singapore	U. S. A.	
59	Do	,,	,,	Continent	470
60	Do	,,	,,	Glasgow	20
61	Gambier	,,	,,	Glasgow	...
62	Gambier	Str	,,	U. S. A.	...
63	Flake & Pearl	,,	,,	,,	...
64	Cube Gambier	,,	,,	,,	...
65	White Pepper	,,	Singapore	,,	...
66	White Pepper	,,	Penang	,,	...
67	Pineapples	,,	Singapore	,,	...
68	Gambier	,,	,,	S. Continent	...
69	Copra	,,	,,	Marseilles	...
70	Black Pepper	,,	,,	S. Continent	...
71	White Pepper	,,	,,	S. Continent	...
72	Black Pepper	,,	,,	U. S. A.	...
73	Do	,,	Penang	U. S. A.	...

800 tons Gambier } Contracts
480 ,, Black Pepper }

MONTHLY RAINFALL 1894–1903 IN THE VARIOUS DISTRICTS OF NEGRI SEMBILAN.

	January.	February.	March.	April.	May.	June.
SEREMBAN.						
1894–1902 ...	49.58	54.70	84.21	97.32	76.08	55.11
1903	4.70	1.15	4.79	7.18	6.42	4.79
	54.28	55.85	89.00	104.50	82.50	59.90
Average	5.42	5.58	8.90	10.45	8.25	5.99
COAST.						
1894–1902	*26.22	(a) 19.74	(b) 10.58	(c) 26.27	(d) 32.45	(d) 45.58
1903	4.47	4.46	1.93	7.40	3.71	1.93
	30.69	24.20	12.51	33.67	36.16	47.51
Average	4.38	4.03	3.12	6.73	6.02	7.91
JELEBU.						
1894–1902	†31.85	†28.52	†70.95	†57.86	†49.96	†37.47
1903	4.35	3.16	2.82	3.96	7.51	2.82
	36.20	31.68	73.77	61.82	57.47	40.29
Average	4.02	3.52	8.19	6.86	6.38	4.47
KUALA PILAH.						
1894–1902	*35.34	*36.65	*29.07	*51.65	*35.63	*26.72
1903	5.58	2.69	2.50	6.57	7.80	2.50
	40.92	39.34	31.57	58.22	43.43	29.22
Average	5.84	5.62	4.51	8.31	6.20	4.17
TAMPIN.						
1894–1902	‡21.32	‡16.10	‡29.10	‡39.15	‡35.80	‡22.56
1903	4.05	7.70	2.55	4.80	4.65	2.55
	25.37	23.80	31.65	43.95	40.45	25.11
Average	5.07	4.76	6.33	8.79	8.09	5.02

	July.	August.	September.	October.	November.	December.
SEREMBAN.						
1894–1902 ...	38.89	46.11	55.52	89.36	76.98	77.22
1903	3.67	4.87	3.11	8.70	11.53	6.71
	42.56	50.98	58.63	98.06	88.51	83.93
Average	4.25	5.09	5.86	9.80	8.85	8.39
COAST.						
1894–1902	(d) 32.98	*48.24	*53.56	*56.59	*69.27	*43.76
1903	9.08	9.79	4.94	7.76	8.46	3.56
	42.06	58.03	58.50	64.35	77.73	47.32
Average	7.01	8.29	8.35	9.19	11.10	6.76
JELEBU.						
1894–1902	†40.05	†40.18	†43.93	†49.87	†75.07	†68.12
1903	1.84	6.54	2.98	4.82	5.33	6.47
	41.89	46.72	46.91	54.69	80.40	74.59
Average	4.65	5.19	5.21	6.07	8.93	8.28
KUALA PILAH.						
1894–1902	*18.02	*26.81	*24.50	*47.51	*49.88	*56.20
1903	2.10	4.05	4.39	6.35	7.17	5.63
	20.12	30.86	28.89	53.86	57.05	61.83
Average	2.87	4.40	4.12	7.69	8.15	8.83
TAMPIN.						
1894–1902	‡22.23	‡22.70	‡23.99	(d) 41.92	(d) 52.45	(d) 33.86
1903	8.25	8.10	4.50	5.90	5.01	6.66
	30.58	30.80	28.49	47.82	57.46	40.52
Average	6.16	6.16	5.69	7.97	9.57	6.75

* 1896-1901, 6 years only. † 1894-1901, 8 years only. ‡ 1898-1901, 4 years only. (a) 1896, 1898 and 1901, 5 years only. (b) 1898, 1900 and 1901, 3 years only. (c) 1898-1901, 4 years only. (d) 1897-1901, 5 years only.

Table showing the daily results of the reading of Meteorological Observations taken at the General Hospital, Seremban, for the month of February, 1904.

Date.	Temperature of radiation.						Temperature of radiation.				Wind.		Temperature of evaporation.			Computed vapour tension.			Relative humidity.			Rain.
											Direction.											
	9 H	15 H	Mean.	Maximum.	Minimum.	Range.	Sun.	Difference sun and shade.	Grass.	Difference sun and shade.	9 H	15 H	9 H	15 H	Mean.	9 H	15 H	Mean.	9 H	15 H	Mean.	Inches.
	°	°	°	°	°	°	°	°	°	°			°	°		in.	in.					
1 *																						
2 *																						
3 *																						
4	80	84	82	87	72	15	150	63	65	7	N.E.	E.	71.6	70.7	71.1	.775	.751	.763	75	64	69.5	
5	79	82	80.5	85	72	13	150	63	66	6	N.E.	N.E.	72.3	70.3	71.3	.793	.742	.767	80	68	74	
6	80	84	82	87	73	14	155	68	65	8	E.	N.E.	71.6	72.4	72	.775	.794	.734	75	68	71.5	
7	78	84	81	87	72	15	158	71	66	6	S.E.	N.E	72.9	72.4	72.6	.810	.794	.802	84	68	76	
8	78	84	81	88	72	16	158	62	66	6	E.	N.E.	72.9	72.4	72.6	.810	.794	.802	84	68	76	
9	78	84	81	88	72	16	154	66	66	6	E.	N.E.	72.9	72.4	72.6	.810	.794	.802	84	68	76	
10	78	85	81.5	89	71	18	165	76	66	5	E.	E.	79.9	71.8	72.3	.810	.781	.745	84	64	74	
11	82	75	78.5	89	71	18	160	71	66	5	S.E.	E.	70.3	75	72.5	.742	.868	.805	68	100	84	.42
12	84	85	84.5	87	72	15	162	75	66	6	S.E.	E.	74.7	75	74.8	.856	.873	.864	80	72	76	
13	84	84	84	87	72	15	166	79	66	6	S.E.	E.	74.7	74.7	74.7	.856	.856	.856	80	80	80	
14	82	85	83.5	88	72	16	166	78	66	6	S.E.	N.E.	73.5	75	75.1	.877	.873	.875	80	72	76	
15	82	84	83	88	70	18	163	75	65	5	S.E.	E.	73.6	74	73.8	.830	.840	.835	76	72	74	
16	81	84	82.5	89	71	18	165	76	65	6	S.E.	E.	74	74	74	.844	.840	.844	80	72	76	
17	82	85	83.5	89	71	18	165	76	66	5	E.	S.E.	75.3	73.4	74.3	.877	.826	.837	80	72	76	
18	82	84	83	88	71	17	160	72	66	5	S.E.	S.E.	73.6	74	73.8	.830	.840	.835	76	72	74	
19	80	75	77.5	87	70	17	160	73	65	5	S.E.	E.	76.6	75	75.8	.916	.868	.892	90	100	95	.83
20	80	82	81	87	70	17	165	78	66	4	S.E.	E.	75	75.3	75.1	.867	.877	.872	85	80	82.5	
21	82	84	83	88	70	18	162	74	66	4	S.E.	E.	73.6	74	73.8	.830	.840	.835	76	72	74	
22	80	82	81	88	70	18	165	77	66	4	S.E.	E.	75	75.3	75.1	.867	.877	.872	85	80	82.5	
23	80	82	81	89	71	18	165	76	66	5	S.E.	E.	75	75.3	75.1	.867	.877	.872	85	80	82.5	
24	82	82	82	89	71	18	165	76	66	5	S.E.	E.	75.3	75.3	75.3	.877	.877	.877	80	80	80	
25	82	82	82	89	71	18	165	76	66	5	S.E.	S.	75.3	75.3	75.3	.877	.877	.877	80	80	80	
26	82	82	83	89	70	19	165	76	66	4	S.E	S.	75.3	75.3	75.3	.877	.877	.877	80	80	80	.87
27	80	82	81	88	70	18	160	72	66	4	E.	S.	75	75.3	75.1	.862	.877	.872	85	80	82.5	
28	80	82	81	89	71	18	160	71	66	5	E.	S.	75	75.3	75.1	.867	.877	.872	85	80	82.5	
29	80	82	81	89	71	18	165	76	66	5	E.	S.	75	75.3	75.1	.867	.877	.872	85	80	82.5	.09

Total 2.21

* Not recorded

J. SHEPLEY PART, M.D.,

Acting State Surgeon.

Singapore.

Abstract of Meteorological Readings for the month of March, 1904.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew point.	Humidity.			
	Ins.	°F.	°F.	°F.	°F.	°F.	°F.	Ins.	°F	%		Ins.	Ins.
Kandang Kerbau Hospital Observatory	29·870	147·0	79·6	88·0	72·3	15·7	75·5	·802	72·7	73·0	S.E.	5·35	2·90

K. K. Hospital Observatory,
Singapore, 19th April, 1904.

A. B. LEICESTER,
Meteorological Observer.

D. K. McDOWELL
Principal Civil Medical Officer, S.S,

Penang.

Abstract of Meteorological Readings for March, 1904.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
	Ins.	°F	°F	°F	°F	°F	°F	Ins.	°F	%		Ins.	Ins.
Criminal Prison Observatory	29·875	147·0	81·3	91·0	74·5	16·5	75·7	·785	70·41	68	N.W.	3·88	2·72

Colonial Surgeon's Office, M. E. SCRIVEN, T. C. MUGLISTON,

Penang, 8th April, 1904. *Asst. Surgeon.* *Colonial Surgeon, Penang.*

Malacca.

Abstract of Meteorological Readings for February, 1904.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew point.	Humidity.			
	Ins.	°F	°F	°F	°F	°F	°F	Ins.	°F	%		Ins.	Ins.
Durian Daun Hospital.	29·839	162·1	79·1	90·2	69·8	63·0	81·6	10·50	69·8	95	N.E.	0·55	0·41

Colonial Surgeon's Office,
Malacca, 22nd March, 1904.

F. B. CROUCHER,
Colonial Surgeon, Malacca.

Malacca.

Abstract of Meterological Readings for March, 1904.

District,	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
	Ins.	°F	°F	°F	°F	°F	°F	Ins.	°F	%		Ins.	Ins.
Durian Daun Hospital.	29·840	161·9	78·9	89·7	70·5	19·7	80·5	10·49	70.5	94	N.E.	2·68	1·38

Colonial Surgeon's Office,
Malacca, 19th April, 1904.

F. B. CROUCHER,
Colonial Surgeon, Malacca.

Perak.

Abstract of Meteorological Readings in the various Districts of the State, for March, 1904.

Disricts.		Maximum in Sun.	Temperature.				Hygrometer.			Total Rainfall	Greatest rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Humidity.		
Taiping	...	157	83·14	93	68.5	24.5	77·14	852	75	6·12	1·97
Kuala Kangsar	...	...	82·62	95	68	27	75·64	793	71	1·16	·83
Batu Gajah	...	160	82·50	94	69	25	76·55	833	75	3·69	1·52
Gopeng	...	...	81·53	93	63	30	76·43	842	78	3·37	·83
Ipoh	...	...	82·41	93	70	23	76·25	823	75	3·56	1·41
Kampar	...	...	...	92	68	24	...	...	...	10·02	1·89
Teluk Anson	...	...	82·09	92	70	22	76·71	848	77	3·15	·69
Tapah	...	..	81·72	93	68	25	75·67	810	74	5·31	2·23
Parit Buntar	...	...	82·58	92	68	24	77·33	868	78	3.01	2.20
Bagan Serai	...	...	81·72	91	68	23	76·21	831	77	2·46	·75
Selama	...	...	82.25	92	70	22	77·32	870	79	2·92	·45

State Surgeon's Office,
Taiping, 12th April, 1904.

M. J. WRIGHT,
State Surgeon, Perak.

Selangor.

Abstract of Meteorological Readings in the various Districts of the State, for March, 1904.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature. Mean Dry Bulb.	Temperature. Maximum.	Temperature. Minimum.	Temperature. Range.	Hygrometer. Mean Wet Bulb.	Hygrometer. Vapour Tension.	Hygrometer. Dew Point.	Hygrometer. Humidity.	Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
General Hospital, Kuala Lumpur	29·846	148·3	80·0	89·4	68·3	21·1	76·2	0·833	73·6	81	S.W.	8·47	2·72
Pudoh Gaol Hospital ,, ...	...	...	...	...	...	...	...	...	...	...	...	4·55	1·88
District Hospital ,, ...	...	...	...	...	...	...	...	...	...	...	...	7·56	2·26
District Hospital Klang	...	...	...	86·1	73·6	12·5	...	...	...	...	...	5·90	2·64
,, Kuala Langat	...	...	...	86·7	70·5	16·2	...	...	...	...	...	3·15	2·00
,, Kajang	...	...	...	93·2	72·5	20·7	...	...	...	...	...	6·74	2·09
,, Kuala Selangor	...	...	...	89·8	75·7	14·1	...	...	...	...	...	2·13	1·53
,, Kuala Kubu	...	...	...	93·1	71·5	21·6	...	...	...	...	...	6·17	1·81
,, Serendah	...	...	...	88·9	75·6	13·3	...	...	...	...	...	7·92	4·28
,, Rawang	...	...	...	87·0	73·2	13·8	...	...	...	...	...	4·97	2·95
Beri-beri Hospital, Jeram	...	...	...	...	...	...	...	...	...	...	...	3·80	1·49
Ulu Gombah	...	...	...	...	...	...	...	...	...	...	...	4·00	2·57
Sabah Bernam	...	...	...	...	...	...	...	...	...	...	...	1·79	1·28

State Surgeon's Office,
Kuala Lumpur, 16th April, 1904.

E. A. O. TRAVERS,
State Surgeon, Selangor.

Negri Sembilan.

Abstract of Meteorological Readings for the month of March, 1904.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Mean Dry Bulb.	Temperature. Maximum.	Temperature. Minimum.	Temperature. Range.	Hygrometer. Mean Wet Bulb.	Hygrometer. Vapour Tension.	Hygrometer. Dew Point.	Hygrometer. Humidity.	Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
	Ins.	°F	°F	°F	°F	°F	°F	Ins.	°F	%		Ins.	Ins.
Seremban	...	...	...	...	...	...	...	...	...	...	...	5·79	3·35
Kuala Pilah	...	...	...	...	...	...	...	...	...	...	...	2·51	·47
Tampin	...	...	...	...	...	...	...	...	...	...	...	6·90	2·60
Jelebu	...	...	...	...	...	...	...	...	...	...	...	4·12	1·92
Port Dickson	...	...	...	...	...	...	...	...	...	...	...	1·31	·79

State Surgeon's Office,
Seremban April, 1904.

J. SHEPLEY PART, M.D.,
Acting State Surgeon.

Pahang.

Abstract of Meteorological Readings in the various Districts of the State, for March, 1904.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
Kuala Lipis, ...	...	...	...	99.5	68	22·8	...	...	...	...	...	2.30	1.23
Raub, ...	...	...	...	92.	68	18·2	...	...	...	...	...	1.37	.64
Bentong ...	...	...	...	92.	70	16·54	...	...	...	...	...	2.00	1.37
Pekan ...	...	...	...	91.	67	15·9	...	...	...	...	...	.64	.26
Kuantan ...	...	...	...	84.	70	14·0	...	...	...	...	...	.88	.80
Temerloh ...	...	...	...	94.	70	24·0	...	...	...	...	S.W.	2.26	1.70

Kuala Lipis, 12th April, 1904.

S. LUCY,
State Surgeon, Pahang

Muar.

Abstract of Meteorological Readings for March, 1904.

District	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.					Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.	Prevailing Direction of Winds.		
Lanadron Estate.	...	...	84	98	64	34	76	...	...	...	...	2·47	1·70

Muar, 3rd April, 1904.

ROGER. PEARS.

No. 5.] MAY, 1904. [VOL. III. PART 1.

AGRICULTURAL BULLETIN

OF THE

STRAITS

AND

FEDERATED MALAY STATES

EDITED BY

H. N. RIDLEY, M. A., F. L. S.,

Director of Botanic Gardens, S. S.

CONTENTS.

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NOTICE.

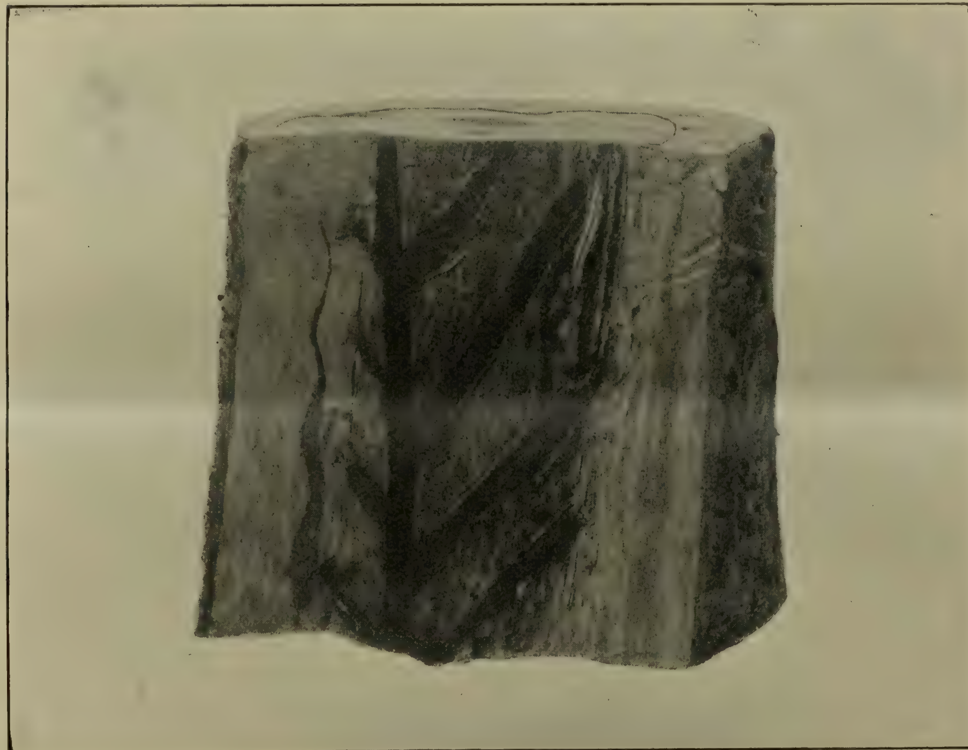
The Scientific and Technical Departments of the Imperial Institute.

His Excellency the Governor has received a despatch from the Right Hon'ble the Secretary of State for the Colonies calling attention to the advantages offered by the Imperial Institute to Merchants, Planters and others, who may wish to have samples submitted to scientific experts for opinion as to their commercial value, &c. The following extracts from a Memorandum published by the Authorities of the Imperial Institute will give an idea of the work undertaken and carried on there.

"The Scientific and Technical Department of the Institute has "been established to acquire information by special enquiries and "by experimental research, technical trials and commercial valua- "tion regarding new or little known natural or manufactured pro- "ducts of the various Colonies and Dependencies of the British "Empire and of Foreign Countries, and also regarding known "products procurable from new sources, and local products of "manufacture which it is desired to export. This work is carried "out with a view to the creation of new openings in trade, or the "promotion of industrial developments."

2. In an extensive and well equipped series of Research Laboratories, a numerous staff of skilled chemists under the direction of Professor Wyndham R. Dunstan, M.A., F.R.S., carry out the investigation of the chemical constitution and properties of new dye-stuffs, tanning materials, seeds and food-stuffs, oils, gums and resins, fibres, timbers, medicinal plants and products, with a view to their commercial utilization. Whenever necessary these materials are submitted to special scientific experts, by whom they are made the subject of particular investigation or practical tests. Reports are also obtained from technical or trade experts in regard to the probable commercial or industrial value of any such products, while full information is collected from official or other trustworthy sources regarding the probable extent and cost of available supplies.

Reports on the results of enquiries or experimental investigations are supplied as a rule, without charge, but should special expenses be incurred in connection with any such reports, or with the commercial value of particular materials or manufactured products, which the Council do not consider themselves warranted in meeting, a statement of such outlays will be furnished, for repayment, when the Reports are supplied. Should an investigation or report of exceptional character be asked for by a Government Department, an estimate of the attendant expenses will be submitted, with a view to ascertain whether authority for such expenditure will be given.



Section of Para Rubber Stem, showing Old Tapping Scar.

AGRICULTURAL BULLETIN

OF THE

STRAITS

AND

FEDERATED MALAY STATES.

No. 5.] MAY, 1904. [VOL. III. PART I.

TAPPING SCARS IN OLD WOOD.

PLATE 5.

One of the oldest Para rubber trees in the Botanic Gardens, Singapore, was recently blown down in a gale and on being cut up for removal it was found to bear in the interior distinct marks of previous tappings in the herring-bone manner. The tree itself had a diameter of 17 inches and was planted in 1884. The annual rings are mostly rather difficult to make out, but some are fairly conspicuous. They are very irregular in breadth and distance apart, but twenty-seven can be made out. If these rings represent years, the tree must have been raised from seed in 1876, and transferred to the Economic Gardens in 1884.

The stem bears the marks of two herring-bone tappings on different sides of the tree and at different dates. The earliest is five inches from the centre when judging from the rings it was about 18 years old, and this scar was covered by 4 inches of sound wood. The marks are quite clear, and when fresh were of a reddish brown colour, standing out clearly against the white wood. The wood of Para rubber trees is when quite freshly cut white, but on exposure it becomes of a light reddish brown.

There is no sign of any injury to the surrounding wood which however, it was noticed was a little harder. The rings of wood formed after the wound healed were broad and sound showing no signs of any check to the growth of the tree. On some of the lateral cuts, knots of harder wood were found, evidently due to suppressed buds. The development of these oval or globular balls of wood on the lower edge of a deep cut are doubtless well known to many planters.

The centre of the trunk showed signs of decay especially at the base, but this had nothing to do with any tapping cuts, from the appearance of which it was clear that absolutely no injury had been caused to the tree. The tree had also been tapped with the short single cuts during the past year and these made no trace of any kind on the wood.

This instructive specimen is preserved at the Herbarium of the Botanic Gardens.

RUBBER PLANTING IN SOUTHERN INDIA.

In the proceedings of the United Planter's Association of Southern India is an article by Mr. CAMERON, Superintendent of Government Plantations in Mysore, which includes some remarks on Rubber planting in that district. Para rubber seems to be a complete failure owing to the long dry season, which is fatal to it. Ceara however seems to be the best rubber for the district. It will flourish from the sea-side to the elevation of at least 4,000 feet. It sheds its seed so abundantly that thousands of seedlings can be picked up wherever a few trees can be found. Recent tapping experiments showed that trees ranging from 8 to 14 years in age are highly charged with latex and that it flows freely when tapped in the correct season and the proper place. During the dry seasons when the tree is leafless the large root limbs should be tapped, and after the rains the tapping should be transferred to the trunk.

The experiments proved that no two trees are exactly alike in productiveness of latex. Between the two extremes of a copious discharge and hardly any discharge at all we seem to possess every degree of productiveness.

It seems to be rather a constitutional feature that some trees contain more laticiferous vessels than others. A mature tree tapped twice a week for 3 months gave of coagulated latex (not all pure rubber) a trifle over 3 lbs. and was still being tapped with good results and no diminution.

Ceara rubber is generally considered inferior to the other cultivated rubbers but with improved methods of preparation it may perhaps take a higher place. It seems certainly well worth cultivation in dry places, where the other rubbers are unsuitable.

Ed.

COTTON NOTES.

Pests.—Mr. MACHADO sends from Kamuning a number of bugs which have been playing havoc with the cotton pods. They were of two kinds, the red cotton bug *Dysdercus cingulatus* described in Bulletin Ser. 1, p. 272, and a well known Cotton pest, and not confining itself to cotton but living also on the Sidas, and herbaceous Hibisci, common plants of waste ground.

The other bug is a broad shield shaped insect about half anin ch long, plain green above and yellowish beneath. It is known as *Nezara viridula* and seems to occur in most hot parts of the world. It has been accused of damaging potato plants in India and is certainly a most objectionable pest. Judging by the number received both of these insects must have been very common on the cotton.

The pods attacked by them were quite destroyed, shrivelled up, and the cotton ill developed and short in staple.

In the cotton cultivated in the Botanic Gardens, Singapore, appeared *Dysdercus cingulatus* as was expected, as it is a common insect here, but not in any great abundance.

A leaf-rolling caterpillar attacked the leaves rolling them up and fixing them with silk. It is a slender caterpillar little more than half an inch long. The head deep brown, the first three pairs of legs black. The rest of the body pale dull green with a darker line down the back. It hatched out at the end of April into a Pyralid moth an inch across, of a pale straw color reticulated all over the wings with blackish brown markings. I have not as yet identified it.

I found no remains of pupæ in the leaf and believe the caterpillar leaves the leaf when full grown and pupates under ground. I found the coccoons of an Ichneumon parasite in one of the rolled up leaves and I noticed that in some cases the rolled up leaf has been bitten through by some enemy which has eaten the caterpillar. I think this must have been done by one of the small caterpillar wasps, of which I saw a number about, who store their nests with caterpillars for their young, but I saw none at work.

These leaf-rollers are the most troublesome insects to deal with on a large scale as their habits effectually prevent the use of any insecticide against them, they being protected by the rolled up leaf and their silk web from being touched by liquid. Nor do they fall from their nests when the bushes are shaken, as some leaf rollers do. So that hand picking seems to be the only remedy. The amount of damage done does not appear to be very great, but it is probable that if they appeared in great numbers they might devastate the cotton fields.

The cotton borer is another serious pest. It is a very small moth-caterpillar about $\frac{1}{8}$ inch long, rather thick and stumpy, mottled black brown and white and sprinkled with a few long white hairs. The head is polished black with white markings.

This bores up the terminal shoots of the branches causing them to wither up. Its burrow is about an inch long, and it does not pupate in its burrow but apparently bores its way out and falls to the ground to pupate.

It pupates in a box in a small oblong hairy coccoon about a quarter of an inch long, but I do not see any of these coccoons about the cotton plants.

A small yellow aphis has also attacked the cotton plants in the Botanic Gardens and caused the leaves to shrivel. It is quite yellow except the eyes and long paps which are black. It attacks the under side of the leaves.

COCONUTS IN THE FEDERATED MALAY STATES IN 1903.

The Inspector of Coconut trees, Mr. L. C. BROWN, has just published his annual report for 1903, which contains a good deal of instructive information. He says that the area under Coconuts amounted at the end of the year to 77,500 acres, which may be roughly valued at between 12 and 15 million dollars. This is a large increase on the acreage recorded in the previous year. A little more than half the cultivated area is in Perak, the rest is almost evenly divided between the three other States. The Inspector gives an account of one estate showing how a little carelessness may produce a great development of the beetle pest. The estate chiefly Para Rubber contained 50 acres of coconuts mixed with the rubber, and these it was decided to destroy. "Unfortunately this was done without sufficient precaution being taken to see that each tree as it was cut down was thoroughly destroyed. The consequence being that in a very short space of time the red beetles and grubs were simply swarming in the stumps and stems lying about. Some idea of the enormous numbers may be gathered from the fact that as many as 20,000 beetles and grubs were killed in one day and before the pests could be got rid of and which was done at considerable expense in about 2 months time over 170,000 of them were collected and destroyed. They spread also to the adjoining estate and several thousands of the beetles were caught in the coconuts there, but the Manager put on several hands to deal with the evil which is now eradicated."

In some instances the Malay owners were aroused to take more interest in their holdings, and collected a body from themselves to clean up the villages in regular order, with highly beneficial results, but the Malays in other parts were callous and indifferent.

At Bagan Dato Estate where there were 800 acres under European cultivation, Mr. BROWN found on his first visit that much damage had been done by rats, but the trees were free from beetles, but towards August the place became suddenly and seriously infested by beetles and grubs, which were found in large numbers in the decayed stumps and in the top soil of black loams. The pests were exterminated by flooding. It is noted that trees between 8 and 10 years old or even older that have been attacked by beetles easily become recoverable with ordinary care in a very short time. On the other hand young trees between the age of three and six years require continual and particular attention and always give considerable trouble, and this may also be said of very old trees which take even longer to come round.

As regards the prospects of the coconut cultivation, owing to the increased interest in Para and other rubbers, the Inspector does not look for a great increase in coconut cultivation by Europeans. In fact it may diminish the coconut trees being cut down to make room for the rubber. This however, he does not think

necessary for some two or three years at least when it will be time enough if necessary to destroy them. On the other hand among Natives the cultivation is very much on the increase. He has great faith in the cultivation of coconuts by natives as no other kind suits them as well except, perhaps, that of padi. He would also favour the cultivation of fruit trees and other productive catch crops planted between the trees, as this yields a better return and there is less vacant land to keep clean. He considers too that the yield from the trees in the majority of cases of native plantations could be increased 50 per cent. with increased care and attention, and that the outlook of the industry in the Peninsula is hopeful.

THE EXPERIMENTAL PLANTATIONS OF THE MALAY STATES.

Mr. ARDEN'S report on the gardens at Batu Tiga, for 1903, shows a good deal of progress. The Gardens have been increased by $27\frac{1}{4}$ acres to a total area of 66 acres, and a good deal of work done in the matter of roads, drainage and buildings, and a large number of useful economic plants were added to the collection.

The *Funtumia elastica* made good growth but was persistently attacked by *Caprinia conchylalis* as indeed it seems to be almost everywhere.

It is proposed to plant a future lot in lines cut through the jungle where they may be less subject to attack.

A collection of fodder grasses is being got together. *Paspalum dilatatum*, a fodder grass of great reputation was introduced and proved very successful. A strong growing and deep-rooting grass, it grows well on steep banks, and might be used for railway embankments. The Natal red-top *Tricholæna rosea*, a very pretty grass of good repute as a fodder also has done well. (These two grasses certainly looked exceedingly promising when I saw them in the Batu Tiga Gardens. The *Tricholæna* was introduced into the Singapore Botanic Gardens many years ago and did well for a time but was eventually driven out of the place it occupied by the native creeping grasses. The *Paspalum* is a valuable acquisition giving a remarkably good mass of fodder, and holding its own well. Could we but replace the Lalang which covers and renders useless so many miles of country in the Peninsula with this grass, there would be a good chance of raising cattle on a reasonably large scale—Ed.)

Experiments were made with Sanseviera, and Para rubber seed and *Blumea balsamifera* were sent to the Imperial Institute for investigation as has been described in earlier Bulletins.

Cotton seed, Egyptian variety, was obtained from Messrs. PRITCHARD and planted experimentally, but did not prove very successful, as owing to excessive moisture the plants grew sickly and were attacked by a mite which destroyed a large number.

There is reason to believe as Mr. ARDEN suggests that other kinds may do better. (Egyptian seed obtained from the West Indies and planted in the Botanic Gardens, Singapore, was a practical failure, but that from Mr. PRITCHARD who liberally distributed it did better—Ed.)

(Having visited the Gardens myself last February, I may say that Mr. ARDEN has done a great deal towards forming an establishment which should prove of the greatest utility to the country, in spite of more difficulties than usual in starting a garden of this character—Ed.)

IMPORTS & EXPORTS OF THE FEDERATED MALAY STATES IN 1903.

Mr. STUART in his annual report on the imports and exports for 1903 in the Malay States, shows an increase in imports of rice in all the States, in Perak 6,500 bags, in Selangor 108,000 pikuls, in Negri Sembilan 6,330 pikuls over last year, and an increase in the import of beans and peas of 31,500 pikuls in Perak and 13,300 pikuls in Selangor. Exports of Gambier decreased by 3,000 pikuls, Copra fell in value but increased in quantity by 1,000 pikuls. Guttas of all kinds (unfortunately the different kinds are not specified and apparently the item includes Rubbers) rose in value and quantity, Pahang supplying $53,000 dollars worth, an increase of $19,000 on last year and Selangor supplying $13,000 as against less than $1,000 worth in 1902. The difference in quantity is less however than this would imply as the rise was chiefly in price for the export for 1902 was 531 pikuls against 625 in 1903.

Rattans and timber showed a substantial rise, chiefly due to supplies from Pahang. Sugar and rice from Perak decreased in bulk though the value of the sugar exported increased. Rice decreased by 12,700 pikuls.

Coffee exports slightly increased though the price fell.

Pepper also decreased in Selangor by 1,300 pikuls, in Negri Sembilan by 3,600 pikuls.

Tapioca exports decreased in all the States except Perak (unaltered) and Pahang an increase of 3,200 pikuls. The export of Betel-nuts increased from Perak and from Negri Sembilan but fell off from the other States, notably from Pahang. The export of Indigo from Perak and Selangor increased also a little.

Generally speaking there appears to have been a decrease in the native cultivator's produce, and an increase in jungle produce, due doubtless to the increasingly careful administration of the Forest Department. The increase both of imports and exports in Pahang is interesting as showing the steady development of that part of the Country.

Ed.

Forest Administration in the Native States in 1903.

This report on the Forest Administration of the Native States in 1903 has recently been published and shows a great deal of work done. We extract from it the following notes of more general interest:—

Gutta percha.—A valuable area of 14,199 acres near Kuang, was found to be rich in Gutta percha, and an extension of 5,000 acres was proposed at Rantau Panjang, also full of the same plant. There is a tree at the latter locality measuring 41 inches at 4½ feet from the ground which has been watched for seed for three years but produced none. The trees in Negri Sembilan flowered in February and March but produced no seed. In the Trollah reserve, Perak, the clearing made in 1902 greatly benefited the young trees which range from 24 inches to 25 feet in height. This area is well stocked with Gutta percha, but where there are blanks seedlings were planted. Plenty of young plants are still to be found all over Selangor, and many have been planted out in the Gutta percha forests. Extraction of Gutta Taban and getah sundik was not allowed during the year but as the fact remains that Singapore continues to receive large quantities, it is very probable that much still comes from the Native States.

Merbau *Afzelia palembanica*, is reported to have seeded plentifully in Selangor. It seems to reproduce itself readily, but like penak (*Balanocarpus maximus*) a large proportion of its seedlings do not even reach the sapling stage. Meranti, and Tembusu (*Fagraea fragrans*) seem to be much more successful in the struggle for existence. (This is interesting as the two first mentioned trees do not appear to have any special facilities for dispersal of their seed, which must fall to a large extent close to the parent tree, and all together, whereas Meranti, and Camphor *Dryobalanops*, also mentioned as a good reproducer, possess winged seeds which drift to some distance from the parent tree when falling and Tembusu fruit is eaten by birds and bats which pass the seed at some distance from the parent tree). Tembusu is mentioned as one of the best trees for driving out Lalang, (and certainly does well on the old tin mines round Kwala Lumpur), Merbau and Chengal (*Balanocarpus*) require to be grown with jungle alongside, to keep them clean would be fatal. Two hundred and seventy trees of Merbau were felled and gave 340 tons of sawn wood.

The methods of extracting timber are very primitive, as a rule a single buffalo is employed to drag it, there being a prejudice against two or more which nothing will shake. In Kwantan most of the heavy logs are dragged by Chinese lumbermen over a rough track made by laying jungle rollers over large poles at right angles. Large logs are some times dragged as far as two miles in this way.

RAMIE.

Under the title "China Grass", its past, present and future, Mr FRANK BIRDWOOD read a paper on Ramie at the Indian section of the Society of Arts (March 10th, 1904) which was published in No. 2679 of vol. III of the Journal of the Society of Arts. The paper contains a good deal of interesting matter. In dealing with the past history of the fibre he shows it was an article of tribute in China in B. C. 2205. He describes the manufacture of the plant by hand in China, and alleges that the cost of production there does not exceed £12 a ton. With regard to supply he says, In Europe a considerable quantity is used every year but England only takes a small percentage of the whole. Japan is the principal purchaser. China to-day has a virtual monopoly and it is his opinion having regard to the market conditions which during the past few years have proved a very pointed lesson to manufacturers it would be mere madness to start an English business on large lines, that is a factory turning out many tons a day, floated with the intention of competing all along the line with other fibres in general use and at the same time dependent for its supply on the celestial merchant. Unless through some arrangement with the local Mandarins it had been able to contract ahead for its raw material. A small company working special lines competing with particular articles and treating a thousand tons or so of raw material every year could complete its juncture without materially affecting prices and there are good profits to be so earned. But if anyone is thinking of investing capital let him see that the output of the business is sufficiently small to remove all fear of enhanced price of raw material and sufficiently large to meet a swamping dump from other rivals. It is essential that some other source of supply should be found so that by competition market prices should be regulated."

The difficulties of degumming, spinning, dyeing and bleaching he considers are things of the past, and "commercial success is undoubtedly within the grasp of the China grass manufacturer. He has had to wade through mud to grasp it. The cultivator was the first cause of failure, he saw that the price of fibre was high, the market was declared to be certain and he rushed into produce. Failure was a foregone conclusion for Chinese methods and Chinese labour were neglected elements of success." This is hardly a satisfactory explanation of the failure on the part of the cultivator, who could not possibly use Chinese labour in India or the Straits at the cost of Chinese labour in China, nor would he make "good profits" at £12 the ton, with a maximum out turn of 10 lbs. a day per man.

It is hard also to see the special value of Chinese methods when the China grass of commerce contains as he says only three-fourths of fibre and one-fourth of gum.

The action of the manufacturer is also condemned, "what the Chinaman could do he could do and so sans process, sans experience, sans machinery and sans market, he poured out his wealth by the

lapful", and that was the cause of his failure. But the author has already explained that the Chinaman had no machinery, nor anything that could be called a process, while there was as far as anyone can see as much of a market for him as for the Chinaman, so that this explanation is no more satisfactory than the previous one.

The question of where the Ramie can be grown is next discussed, and a few (very few) of the countries where it has been successfully grown are mentioned. "In the Straits Settlements, the comment was made that there seemed little chance of establishing its cultivation unless the Government first showed that the experiment was likely to succeed by cultivating a patch of an acre or thereabout". (The author does not seem to be aware of how much has been done in experimental cultivation in the Straits Settlements, or indeed elsewhere,) "It is stated to be indigenous to Singapore" (which it certainly is not) etc.

After giving the outturns from various experimental patches and showing the discrepancies in them and the causes of them, he says that speaking generally the yield of clean strips (ribbons) would approximate $\frac{3}{4}$ ton per acre, at all events if care is taken and the plant properly cultivated over half a ton should easily be obtained in the course of a year.

"But one thing is clear (he says) if the fibrous strips can be produced by the cultivator at £20 a ton without loss he will not have any difficulty in earning a dividend on his outlay but not through sales at public auction for once again stress has to be laid upon the fact that the crops will be machine not hand produced and will resemble nothing in the market. The planter's production will in fact at all events until the commercial use of ramie fabrics has become more general be unsaleable except to the owner of the process by which the strips will be degummed and who will alone be in a position to spin or dispose of the filasse. So here we have a planter producing a substance which we will assume it would pay him to grow but with a one man market. The conclusion is obvious the cultivator and the manufacturer must for all practical purposes be one,—the agreement being that what one produces the other will take".

The characteristics of the fibre and its various uses are discussed, and in conclusion the author suggests that the time has come for further action on the part of the Government of India. Germany he says in her African Colonies, Belgium in the Congo and Holland in Java are fostering the cultivation of the plant and the production of a raw material which will * * * contain a fibre which manufacturers are prepared to buy," England and her Colonies lag behind. His suggestion is that the Government should guarantee to the manufacturer, (1) interest on the capital spent in the erection of a plant capable of treating a certain amount of fibre a year, (2) to give the goods of the manufacturer the preference if he can produce a thread yarn or other material compared with other samples used by them, and manufactured from other than Indian products, and (3) to guarantee interest on the manufacturer's present products, if he will

undertake to use the Indian product when grown, and to the cultivator the Government is to guarantee interest on capital for a period of so many years, to carry out the necessary experiments on the undertaking that if they are successful the cultivator will annually grow a fibre of right quality to a given weight. A discussion followed the paper.

Though exception may be taken to some parts of the paper, it is worth the attention of Ramie growers and others interested in cultivation generally.

GUTTA-PERCHA IN THE PHILIPPINES.

MR. SHERMAN'S REPORT.

A Bulletin by Mr. P. L. SHERMAN, Chemist in the Bureau of Government Laboratories, Manila, on the Gutta Percha and Rubber of the Philippine Islands, carefully reviews the subject both from a commercial as well as scientific point of view.

Mr. SHERMAN has collected information in all the principal gutta producing countries and naturally concludes that the future of gutta-percha lies in plantations. Under this head he remarks "The principal gutta-percha plantations now under cultivation and in which much useful and desired experimenting is being done are located at Tjipitir and Buitenzorg in Java, on Rhio Island at Singapore and Bukit Timah on Singapore Island, on Penang Island, and at one or two places in the Federated Malay States.

Enough time and work have been spent to demonstrate most conclusively that gutta-percha trees can be raised not only successfully but also without much trouble or great outlay of money, and all the nations having tropical possessions in the East, except the United States, have made a start toward gutta-percha plantation, but the Dutch are the only ones so far who have gone into it on a grand scale, and unless appearances are deceitful they will have a monopoly on the plantations of the gutta-percha of the future, as sure as they have on the forest gutta-percha of the present day."

R. D.

ZALACCA CONFERTA.

This palm is very abundant in the Malay Peninsula, and is well known under the names of Asam Paya, and Kelubi. It grows in jungle swamps, and is almost stemless with large and horribly spiny, thickets of the plant being almost impenetrable. The fruit is produced in a dense head, about a foot or more long, each being about 2 inches long and covered with yellow scales. The seed inside is covered with a very acid pulp. These fruits are collected and sold by Malays for the acid pulp of which they seem very fond and indeed, acid as they are they form not a bad thirst quencher. Mr. DUNN of the Hongkong Botanic Gardens lately sent me a bit of one of these fruits which are imported into China, and writes

"The Chinese call it Loong Lun Ko, which means Dragon scale fruit. The "flower" (perhaps the husk of the fruit) is boiled to provide a Cough mixture and the fruit is eaten as a sweetmeat."

Editor.

Hail in the Malay Peninsula.

KUALA LUMPOR,
Forest Office, 5th May, 1904.

The Editor
THE AGRICULTURAL BULLETIN.

Sir,—I notice in the March No. of your Bulletin some remarks upon Hail in Ulu Langat.

It may be of some interest to you to know that on two occasions I have seen Hail in Perak. First in 1889, at Ipoh, when visiting the District and Mr. GRANT MACKIE was with me. It commenced by a very heavy thunderstorm and heavy wind, after which it hailed for about 5 minutes.

Second occasion was when I was Manager of Mr. DOUGLAS OSBORNE'S Coffee Estate in Gopeng, Kinta, Perak, in 1897. It commenced in similar manner as above but only lasted for about one minute.

Yours faithfully,
FRED. DENNYS.

COTTON CULTIVATION.

JUGRA ESTATE,
Selangor, May 9th, 1904.

DEAR SIR,—On page 94 of the Bulletin you publish a Précis of Correspondence on the above subject, wherein I am credited with the assertion that "the whole crop per acre would only pay one coolie for two months."

My experience of the cultivation has been so limited that I would not be justified in expressing such an opinion.

To the best of my recollection, some quotations from broker's report and Javanese opinions, which appeared in my brother's original paper, have been my only contribution to the subject.

I am, Yours very truly,
CYRIL E. S. BAXENDALE.

The Editor
Agricultural Bulletin,
Singapore.

AGRICULTURAL SHOW.

At a meeting of the General Committee of the Agricultural Show held at Kuala Lumpor on April 16th, the Secretary reported that the funds collected up to date amounted to $4,827.50.

The prize lists were discussed and the money allotted for the various sections. The prize fund was put at $2,630. The prize list will shortly be printed.

The date for the Show has been fixed early in August when it is hoped that His Excellency the Governor may be able to be present, and will be open from 11 A. M. on the first day and from 8 A. M. on the following days to 6 P. M.

The price of admission has been fixed as follows:—

First day from 11 A. M. to 2 P. M. - - $2,00.
All other times - - - - 0.20.
All subscribers of $10 and upwards shall be entitled to free tickets for themselves and their families on all days that the Show is open.

All exhibits and exhibitors will be carried free over the Federated Malay States Railways, and the Straits Steam Ship Company has promised a reduction of 25 % on the usual passages.

A notice giving additional information is published on page 180.

TERMITES AND RUBBER.

Mr. FREUDWEILER of Bila, Sumatra, has been visiting the Gardens and Native States, and reports that he has had some trouble with termites, which he has been treating successfully with Corrosive sublimate, a solution of which in water is poured over the trunk of the tree after removing the mud casing thrown up by the termites and a hole being dug at the base of the tree, the liquid is poured in and causes the death of the pests.

He mentions a curious case of damage to a tree by the termites. The tree was about 6 inches through, and was tunnelled out by the termites for about 6 feet so that it was quite a hollow shell. It was however, still alive, and produced plenty of latex and seemed quite unhurt. However, a gale of wind twisted it round and upset it, and on being cut up two pounds of rubber was found in the hollow interior. The termites in trying to bore their way to the outside had tapped the bark from the inside and produced a flow of latex into the hollow trunk. The rubber was of course very dirty, mixed with debris of all kinds.

Ed.

RUBBER IN PERAK.

KLANG, F. M. S.

14th May, 1904.

DEAR SIR,—At the annual meeting of the Selangor Planters' Association held in Kuala Lumpur on 30th April, I was asked to place on record, in the form of a short letter, my impressions of the work now being done in connection with the cultivation, tapping, and preparation for the market, of Para Rubber, by Mr. F. A. STEPHENS of Tebong Estate in Perak, and this I gladly agreed to do, inasmuch as I think that we are under a debt to Mr. STEPHENS, the magnitude of which will perhaps be realised by those who care to hear what I have to say about the part he is playing in the development of this important industry.

Mr. STEPHENS commenced tapping in October last, and up to the end of March he had collected 4,004 lbs. of wet rubber, equal at a 20% loss to 3,203 dry. The cost in labour was $929.49, with a Check Roll average of 44.8032 cents. More than one small lot has already been shipped and sold, the price realised for the last consignment being 4*s.* 6*d.* On the seas at present, is another lot, this time of no less an amount than 14 piculs, or 1,867 lbs., and in his drying-shed, is a stock of sheets in various stages of preparation, which in itself would provide food for thought for men over here, could they only see it. The Ceylon export for 1903 is given at 41.684 lbs. so that Mr. STEPHENS has in six months collected on his Estate, about $\frac{1}{13}$th of the whole Ceylon production for last year. Mr. STEPHENS kindly let me see his books, and from them it is clear that the collecting, curing, packing, despatch to Europe, payment of export duty and all other charges, have cost him 55 cents per lb. of dry rubber. The account is made out as follows:—

Tapping, Curing, and Packing on Estate per lb. ...	30 cts.
Account Sales. Including all Penang & home charges	23 ,,
Export duty and freight to Penang	3 ,,
Total...	56

The big commission of 6% had been paid to Agents and Brokers, and as Mr. STEPHENS pointed out, this made his account sale charges very heavy. With a Check Roll average of 35*c.* therefore, planters may, if they are as successful as Mr. STEPHENS has been, calculate under 50*c.* per lb., as the cost of their rubber from the tree to the buyer. There are obviously other items which have to be taken into consideration, such as Management, Buildings, Weeding and so forth, but as these differ with each Estate, I do not propose to deal with them here. It is enough that Mr. STEPHENS has shown us what the actual handling expenses of the rubber are. An ordinary clothes mangle, a heavy ink bottle as a preliminary roller, some kerosine oil tins cut in half lengthways in which the latex is poured to set, a fine mesh sieve, jam or milk tins to collect the milk, farriers' knives costing 75 cents each and bought in any kedai, lines

of bamboos upon which the sheets of rubber are hung to dry, and a few pans of charcoal to hasten the process, and keep off mildew, are Mr. STEPHENS' stock-in-trade. His latex shed is an attap building about 12′ square, his drying-house an enclosed space under his Bungalow, say 18′ square. With this simple equipment and limited accommodation, he is able to turn out rubber which, I venture to think, will command the highest prices. The tapping coolies, with their six months' training, are doing fast, and at the same time most careful, work, and each man brings in two large pails of latex, equal I should say, to about a kerosine oil tin full. Mr. STEPHENS swears by the old "herring-bone" system of tapping, which he has proved to give him the best results. He drives a small nail into the foot of his tree, hangs his tin upon it, and leaves the tin there until that particular tree is finished with. He says that perhaps he gets more scrap in consequence, but then of course he is saved the enormous cost of tin distribution and washing. His methods may not be as clean as you would expect to see in a first class dairy, but as he gets the best results at a minimum cost, I judge that his example is well worth following. He taps as a rule from 5.30 until 11 A. M., and if he sends his coolies out in the afternoon, he finds that they get only about ⅔rds as much latex. His trees are tapped once every other day. Having been very short of labour, it was impossible for Mr. STEPHENS to keep his weeds in hand, so he set to work with scythes and now succeeds at a cost of about 50 cts. an acre a month, in mowing his land so close that from the colour of the coffee trees, which still grow amongst his rubber in some fields, it is evident that not only do the latter in no way suffer from the grass, but the remarkable freedom from white ants, which Jebong enjoys, rather points to there being some truth in the theory that the presence of grass keeps these mischievous insects away.

This does not pretend to be at all an elaborate report upon Mr. STEPHENS' work. It would take me much longer than I have time for to treat the subject as it deserves, but I think that when a planter does what Mr. STEPHENS has succeeded in doing, with a force of (I may say) 50 coolies on an Estate of 380 acres opened, and in face of difficulties which would have made many a good man give up, it is about time that his fellow planters, at any rate, should hear of it, and if they are wise and want to see for themselves what can be done by a man who puts all his heart into his work, they had better start for Jebong without waste of time, and they will not only find that this account is in no way exaggerated, but they will be given every opportunity of seeing a very fine Estate in the bargain.

I am, Dear Sir,

Yours faithfully,

E. V. CAREY.

The Editor,
Agricultural Bulletin,
Singapore.

Parasitic Fungi on Hevea Braziliensis.

In the Notizblatt des Konigl. Botanische Gartens und Museums zu Berlin, (Vol. 4, No. 34, p. 133) is a paper by P. HENNINGS on fungi parasitic on Heveas. He describes and figures fine leaf-fungi, *viz.*, *Phyllachora Huberi*, *Dothidella Ulei*, *Aposphæria Ulei*, *Ophiobolus Heveæ* and *Parodiella Melioloides*, All have only as yet been found in the Amazonas district of Brazil, but do not seem to be very serious, though the *Ophiobolus* quite destroys the leaf and is perhaps the most dangerous of them.

A. Meliola probably *M. Amphitricha*, Fr. also occurs with the *Phyllachora* and is very destructive.

On sick and rotten trees of various species of Hevea *Allescheriella uredinoides* was found.

Professor ZIMMERMAN has found in the Culture Garden at Buitenzorg *Carticium javanicum*, Zimm. which also grows on Castilloa and other cultivated plants, and *Nectria coffeicola* and on the leaves, *Phyllosticta Hevea* and *Glaeosporium Elasticæ*, a known parasite on Ficus elastica. *Stilbum Hevea* occurs on dying twigs.

Though none of these fungi are stated to do serious damage as yet, it would be as well for cultivators to keep an eye on any spots or signs of fungi appearing on the leaves or twigs. Attacks from leaf-fungi would be much more difficult to deal with in the case if a lofty tree like Para rubber than with a short accessible plant like Coffee, and all know the damage done to the latter plant by *Hemileia.*

The Ceylon canker is reported from the Malay States, but I have not seen it.

A planter in Sandakan sends me a specimen of a fungus which appears to be most pernicious. He writes "My attention was attracted by a tree which appears to have been white washed. The colouring commenced about eight feet from the ground and extended upwards for about six feet, taking the branches in that space from 1 to 2 feet. The first branches affected were dead and as red as you see by pieces sent, the other affected branches were dying.

All over the affected part the rubber was streaming in long tears. It is apparently purely local. A two stemmed tree was affected in one stem only. There are four trees attacked in this way.

The bark sent was densely covered with a fine mycelium running between the bark ridges, and these latter were covered with a salmon pink mass apparently of felted mycelium. I can see no fruit on the plant. I have seen a somewhat similar fungus, on stems of Ramie, and *Strobilanthes* when grown too close together and very damp. The fungus had grown over the small mosses and hepatus on the bark, which was quite dead and the wood beneath was dead and bored by wood beetles.

Mr. FREUDWEILER to whom I showed the specimens, said he had seen the fungus in Sumatra on a few trees and had noticed that it was all in a line of trees as if the spores had been blown along by the wind. He found that by scraping the bark and treating with copper sulphate and lime. Of course a pest like this should be looked for and vigorously treated, the destroyed bark cut away and burned, affected boughs removed and sulphate of copper liberally used. It is probable that too close planting may be responsible for the development of this fungus, as the similar one on the *Strobilanthes* was in the dark part of the bush where the boughs were crowded together.

Fomes semitostus.—Some eight or nine years ago the coolies carelessly made a large bonfire close to a row of Para rubber trees, of fairly large size, the trunk of one of which was badly burnt and another considerably injured. Both trees gradually died and were removed. But the next two or three trees on either side became sick and eventually a large mass of the fruiting stage of *Fomes semitostus* was seen at the base of the trunk just pushed up above the ground and the roots being destroyed the trees perished. This year two more smaller trees have gone in the same way, and it is clear that the fungus has been slowly spreading underground. Attempts were made to check it by treatment with copper sulphate and lime, but as the fungus had got a strong hold of the roots of the tree treated and it was very difficult to get at all the infected part, this was not successful. The development of the damage was very slow, and very different from the rapid growth of such underground fungi as *Rosellinia*. Nor did it attack any young plants, seedlings or any other herbaceous things on the ground as the true root fungi do.

The fruiting part (*sporophore*) of *Fomes semitostus* is a broad flat rounded plate often very irregular in form, usually reniform 4 to 6 inches across, and of an orange red colour beneath paler above, where it is marked with rings and fine striæ, beneath can be seen with a lens the honeycomb-like structure of the hymeneal surface. The texture of the fungus is tough and it possesses a strong mushroom-like scent. The sporophores growing close together often form large irregular masses.

This fungus is very common on decaying stumps of all kinds of trees and is properly speaking a dead wood feeder, but like a number of allied species attack also living trees.

As a disease-fungus I would class this as *contagious* as opposed to an *infectious* fungus, as it appears to spread from root to root in the ground without being dangerously dispersed through its spores. A dead stump may be attacked above or just below the ground, and the mycelium spreading along the decaying roots may come into contact with those of a living tree and so the attack is spread. These contagious fungi are more easy to deal with than the infectious ones, of which the spores are blown from tree to tree and attack the plant where they light, (as in the fungus previously

described). The infected trees should be destroyed and the roots dug out, every bit of dead root or decayed timber being removed and the ground well saturated with copper sulphate and lime.

TUBEUF in writing of a similar parasite in Europe (*Fomes annosus*) whose habits are very similar to those of *F. semitostus* states that the best way of combating the ravages of the parasite is isolation of infected areas. These should be isolated with ditches with vertical sides deep enough to cut through all roots, care being taken to leave no diseased stems or roots outside the circle. After remaining open for a time the ditch must be filled again with soil to prevent the formation of sporophores on the exposed roots. All diseased stems should be felled and burnt, or deeply covered with soil to prevent the formation of sporophores. In fact isolation of these contagious parasites should be done by ditches as the infectious parasites are isolated by screens of trees of another species.

Since writing the above I have seen further attacks of this fungus in a Rubber estate and have also a report of what is probably the same thing in Selangor. The roots of the trees are destroyed usually on one side, a puff of wind comes and over it goes. If the orange colored sporophores are ripe the spores may then be blown on to the next tree and infect that.

H. N. RIDLEY.

Note on the Moisture in prepared Rubber.

A biscuit of Para rubber from one to three millimetres in thickness which had been smoked and was commercially ready for shipment and which was apparently dry was found to contain 3·09 % of moisture.

The moisture was determined by drying for 32 days in a dessicator over calcium chloride. The drying being rapid at first but very slow at the finish, 2·1 % of water being lost in the first 48 hours.

This experiment was carried out in order to give some guide to the probable loss of weight of rubber during shipment from here to Europe. If managers of those estates from which rubber is now being exported will, during the next two months send to the Government Analyst's Laboratory, Singapore, samples of such rubber I will determine the moisture in the samples and publish the results in the Bulletin, and in that way arrive at reliable figures as to the maximum loss of weight properly prepared rubber should give.

ON VARIATION IN QUALITY OF LATEX.

The variation of quality of the latex from Hevea Braziliensis in different positions of the tree.

The following data were obtained on analysis, the source of latex being a tree 13 years old, tapped for the first time.

Position of the cut.	Nature of cut.	Percentage of crude Rubber in latex.	Percentage of Resin in the crude rubber.
1. A large root exposed by removal of some soil.	Simple three inch cut.	43.8	2.27
2. The main trunk 1-2 feet above the ground.	Herring bone.	44.4	2.12
3. The trunk after forking 20 feet above ground.	Herring bone.	39.8	1.88

Some difficulty was found in ensuring the purity of the latex and its collection from different places under similar conditions, and the above results must be regarded as preliminary. Further investigation is in progress.

It will however be noted that the latex from the higher portion of the trunk are poorer in rubber than the latex from lower down—at the same time the proportional amount of resin in the latex appears to decrease.

P. J. BURGESS.

Tengah Bark.

From DISTRICT OFFICER, DINDINGS,

To H. N. RIDLEY, Esq., *Singapore.*

20th May, 1904.

Mr. BURN-MURDOCH asked Mr. BORGES, Forest Ranger, Dindings, to write the attached memorandum *re* Tengah Bark for the Agricultural Bulletin; it is condensed from a report on the Mangrove growth in the Dindings River. The dye obtained being preferred to 'bakau' bark dye. There has been a very large quantity of it exported from here, so much that the "tengah" has been cut in preference to "bakau" owing to the valuable bye-product furnished by the bark which also strips more easily.

R. SCOTT.

H. N. RIDLEY, Esq.,

Director. of Botanic Gardens, S. S.

20th May, 1904.

Tengah Dye.

The Tengah tree grows in salt swamps preferably inland, as it does not seem partial to the presence of water. The leaves are small fleshy elliptical and grow in clusters. The bark is light red and the heartwood redder than the other species of mangrove, straight fibred and fissile.

This tree if protected will soon form the prevailing species as it is hardy and comes into bearing at a smaller diameter growth than the other kinds, and is a profuse seeder with a tendency to gregariousness. It is popular as fuel and can be used immediately after conversion, but is supposed to burn fast, barking may account for it.

The bark is stripped off the freshly felled logs with "parangs" by women, and arranged into hollow cylinders of fixed lengths (9"). Rings made out of the climber "Jhanghat" are slipped on to both ends. This maintains uniformity as chips of bark are then hammered into the crevices with a wooden mallet. Bakau bark is here used for filling instead of Tengah which is now rather scarce. This depreciates the dye as that extracted from Bakau bark is not so well absorbed and tends to harden cloth, etc., perhaps owing to its coarse constituents. It is easily washed out.

In two days time a hundred bundles could be prepared for 50 cents. The selling price per 1,000 bundles is $15 locally and from $20 to $25 in Penang. The price fluctuates owing to the importation of Tengah bark from Siamese territory to which place this trade is chiefly confined, about 8 to 10 bundles can be extracted from a tree 6 to 8" diameter.

The Tengah bark yields a rich red dye indispensable as a preservative for sails and fishing-nets, the latter being dyed every fortnight.

A tub is well packed with Tengah bark and then water free from saline or mineral matter poured in. Three brews of dye are extracted, the liquid dye when ready being poured off and fresh water added to the tub, the processes taking about four months altogether, each time it has to be kept longer in water till the required strength is attained. The first dye is extracted in about 20 days.

Sails and nets before being dyed must be carefully rinsed in fresh water and dried. Sails are steeped twice or thrice as required and dried each time.

Finally to fix the dye it is put into an inverted tub placed over a pan of water, and steamed for fifteen minutes, care being taken that it has been previously air-dried; a framework resting on supports in the tub prevents contact with the water underneath.

V. P. BORGES.

RUBBER-TAPPING IN THE DRY SEASON.

Mr. LARKIN whose estate at Castle-wood I have recently visited, tells me that during the late dry month of March, all his trees in one part of the estate shed their leaves simultaneously and remained bare for a time. He continued to tap during this period and found no diminution in the amount of latex produced.

There is a general idea that latex flows slowly or not at all during this period, and there was a certain amount of evidence for this in the experiments of the Botanic Gardens last year. Have any other planters tried continuous tapping through the resting season and with what result?—Ed.

THE USE OF JERINGU
Acorus Calamus against termites.

Mr. MACHADO, lately sent some rhizomes of the Jeringu or Deringu (*Acorus Calamus*) a plant often cultivated by the Malays for medicine. It is one of the *Aroideæ*; an aquatic plant with swordlike leaves about 3 feet tall and an aromatic creeping stem. This is being used by the Malays as follows:—The dried roots are pounded to powder and spread round the base of the tree. All ants die and the others do not appear to come up to the surface to replace them, as in the case of other insecticides. Mr. MACHADO tried it for ten days and found it efficacious. The plant is so common and so easily grown in any wet ditch that it may be well worth experimenting with it.

H. N. RIDLEY.

Erratum.

LANADRON ESTATE, MUAR,

30th May, 1904.

DEAR SIR,—In my article on the "Preparation of Crude Rubber" in your last issue a printer's error occurs which I shall be glad if you will correct, page 120 line 11 should read "which loses *15%* in washing instead of 5% as stated.

Yours faithfully,

F. PEARS.

The Editor,

Agricultural Bulletin, Singapore.

THE BELGIAN RUBBER EXPERT.

HIS IMPRESSIONS OF CEYLON.

M. Octave Collet, the Belgian rubber scientist and expert, who is on a visit to the Island, investigating our methods of planting,

growing, and collecting rubber, has just ended his visit to one of the best and most representative rubber estates, Culloden, in Neboda. A description of the tapping on this estate from the pen of the manager, Mr. R. W. HARRISON, appeared on the 12th instant, it will be remembered. M. COLLET'S visit to the estate had for its special object a series of

TESTS WITH A TAPPING KNIFE

which M. COLLET has lately invented. M. COLLET returned from Culloden this morning, and a representative of the *Times of Ceylon* elicited from him that the tests were eminently satisfactory. He is under a pledge to communicate the results of his tests to the local "Tropical Agriculturist," and was therefore reluctant to say more than that he thinks that the use of his knife in Ceylon will lead to a better flow of the latex, and certainly that it will result in all injury to the tree being avoided. The knife can only penetrate the bark, and the incision made is such that

THE WOUNDS HEAL PROMPTLY.

M. COLLET is quite satisfied with these results and will not make any more experiments with his knife in Ceylon. He is very much impressed with the magnificent growth and the fine character of the Para trees on Culloden; it is one of the best estates he has seen in the East, he says, and he has, judging from what is done at Culloden, the best anticipations for the rubber industry of the Island.

THE SOIL IN CEYLON IS POORER

than in the Straits, thinks M. COLLET. "It is very fine soil for rubber, of course, but the soil in the Straits is, comparatively, finer, I think," he said. One thing that he noticed interested him very much, and that was the very hardy character of the Para tree. "It grows amidst rocks and all sorts of unevenness," he remarked, in a tone of surprise. Culloden estate taught him that one cannot hurt the *Hevea* tree by any force of circumstances. Where the Straits are better off than Ceylon is that, their soil being much better, the trees in the Straits attain in two years the girth and fine appearance which in Ceylon they would take four years to put on. M. COLLET took several

PHOTOGRAPHS OF CULLODEN ESTATE,

and the typical trees there, which he was busy developing this morning. These will furnish illustrations for his second volume dealing with Asiatic Para Rubber.

M. COLLET went up to Peradeniya by this afternoon's train and will stay some days at the Botanical Gardens. He will then proceed to Kepitigala and other rubber estates in Matale, returning to Colombo next week.

(*From Ceylon Times, April 21st, 1904.*)

BATU TIGA, SELANGOR,
14th May, 1904.

AGRI-HORTICULTURAL SHOW.

GENTLEMEN,—I have the honour to inform you that the Standing Committee of Agri-Horticultural Shows of the Straits Settlements and the Federated Malay States, has decided to hold the first of a series of joint annual shows, at Kuala Lumpur, on the 5th, 6th and 7th of August next.

The exhibition, which is under the distinguished patronage of His Excellency the Governor and High Commissioner, the Sultans of the Malay States, the Resident-General, and others, will be opened by His Excellency at 11 A.M. on 4th August.

2. With a view to making the show as complete and as representative as possible, the exhibits will be classified in several divisions as follows, a special committee having been appointed for each division:—

Division *A*. "Agricultural Produce"
(Hon. Sec., Mr. L. C. BROWN).

Division *B*. "Flowers, Fruits and Vegetables"
(Hon, Sec., Mr. H. E. BYRNE).

Division *C*. "Stock and Dairy Produce"
(Hon. Sec., Mr. T. W. CLAYTON).

Division *D*. "Horses and Dogs"
(Hon. Sec., Mr. SYDNEY R. SMITH).

Division *E*. "Native Industries and Manufactures: Implements and Miscellaneous"
(Hon Sec., Mr. HERBERT C. ROBINSON).

3. The prize lists are now in the printer's hands, and a number will be sent to you immediately they are received; prize lists in Malay, Tamil and Chinese will be forwarded as soon as possible.

4. The Committee will pay the cost of transport of approved exhibits and native exhibitors (except in Division *D*, and exhibits by Europeans) from all parts of the Colony and Federated Malay States. All exhibits and exhibitors will be carried free over the Federated Malay States Railways, and a reduction of 25% on the usual freight and passages will be granted by the Straits Steamship Company.

5. I am directed by my Committee to invite you to lend your active co-operation in the endeavour to make the Show a success.

Any further information may be obtained from the Hon. Secre-

taries above-mentioned, the Hon. Secretary, General Purposes Committee (Mr. J. P. Swettenham), or the undersigned.

I have the honour to be,

Sir,

Your obedient servant,

STANLEY ARDEN,

General Secretary.

To the Members of the Standing Committee and the District Officers, F. M. S.

MISCELLANEOUS.

Notices to Subscribers.

I. For the information of subscribers and others who have been unable to complete their series of the Agricultural Bulletin of the Straits and Federated Malay States notice is here given that Nos. 1, 7, 8, 9, of the Old Series (1891–1900) and Nos. 1, 8, 9, 10, of the New Series Vol. 1 (1901–1902), the first issues of which have long been exhausted, are now being reprinted, with plates, and will shortly be ready.

II. Subscribers whose subscriptions are still unpaid are requested to send in their subscriptions for the present year as soon as possible. Members of the United Planters Association are requested to send in their subscriptions in future directly to the Editor and not to the Secretary of the Association.

II. Subscribers outside the Peninsula will in future be charged \$3.50 per annum instead of \$3 in order to cover postage.

Meteorological Observers are asked to send in their returns to the Editor, to arrive before the 10th day of the following month if possible, so as to be in time for going to press.

SINGAPORE MARKET REPORT.

April, 1904.

Articles.	Quantity sold.	Highest price.	Lowest price.
	Tons.	$	$
Coffee—Palembang	...	26.00	25.00
Bali	30	24.00	23.00
Liberian	253	20.00	18.75
Copra	2,720	8.20	7.15
Gambier	2,520	10.50	9.62½
Cube Gambier, Nos. 1 & 2	125	16.00	14.00
Gutta Percha, 1st quality	...	270.00	200.00
Medium	...	190.00	100.00
Lower	...	120.00	17.00
Borneo Rubber	...	140.00	85.00
Gutta Jelutong	...	8.50	8.00
Nutmegs, No. 110's	...	45.00	
No. 80's	...	65.00	
Mace, Banda	...	130.00	100.00
Amboyna	...	90.00	80.00
Pepper, Black	863	29.75	28.50
White	200	48.00	45.00
Pearl Sago, Small	100	5.85	5.00
Medium	...	...	...
Large	...	...	...
Sago Flour, No. 1	3,305	3.60	3.30
No. 2	335	1.17½	1.15
Flake Tapioca, Small	760	4.65	4.10
Medium	44	...	...
Pearl Tapioca, Small	481	4.70	4.20
Medium	619	4.75	4.10
Bullet	...	...	...
Tin	2,395	80.50	77.50

Export Telegram to Europe and America.

For Fortnight ending 15th April, 1904.

Wired at 3 p. m. on 16th April, 1904.

					Tons.
10	Tin	Str.	Singapore & Penang	United Kingdom &/or	850
11	Do	,,	,,	U. S. A.	1,330
12	Do	,,	,,	Continent	411
13	Gambier	,,	Singapore	London	...
14	Do	,,	,,	Liverpool	50
15	Do	,,	,,	U. K. &/or Continent	330
16	Cube Gambier	,,	,,	United Kingdom	40
17	Black Pepper	,,	,,	,,	150
18	Do	,,	Penang	,,	190
19	White Pepper	,,	Singapore	,,	...
20	Do	,,	Penang	,,	...
21	Pearl Sago	,,	Singapore	,,	20
22	Sago Flour	,,	,,	London	400
23	Do	,,	,,	Liverpool	1,500
24	Tapioca, Flake	,,	Singapore & Penang	United Kingdom	170
25	Do Pearl	,,	,,	,,	120
26	Do Flour	,,	Penang	,,	750
27	Gutta Percha	,,	Singapore	,,	...
28	Copra	,,	Singapore & Penang	,,	...
29	Buffalo Hides	,,	Singapore	,,	100
30	Pineapples	,,	,,	,,	cases 24,500
31	Gambier	,,	Singapore	U. S. A.	...
32	Cube Gambier	,,	,,	,,	40
33	Black Pepper	,,	,,	,,	100
34	White Pepper	,,	,,	,,	50
35	Black Pepper	,,	Penang	,,	...
36	White Pepper	,,	,,	,,	...
37	Nutmegs	,,	Singapore & Penang	,,	12
38	Flake & Pearl	,,	,,	,,	210
39	Pineapples	,,	Singapore	,,	350
40	Do	,,	,,	Continent	2,000
41	Gambier	,,	,,	S. Continent	110
42	Do	,,	,,	N. Continent	290
43	Cube Gambier	,,	,,	Continent	30
44	Tapioca Flake	,,	Singapore & Penang	,,	170
45	Tapioca Pearl	,,	,,	,,	160
46	Copra	,,	,,	Marseilles	440
47	Do	,,	,,	Odessa	920
48	Do	,,	,,	S. Continent	220
49	Do	,,	,,	N. Continent	1,350
50	Black Pepper	,,	Singapore	S. Continent	190
51	Do	,,	,,	N. Continent	190
52	White Pepper	,,	,,	S. Continent	30
53	Do	,,	,,	N. Continent	190
54	Do	,,	Penang	S. Continent	10
55	Do	,,	,,	N. Continent	40
56	Black Pepper	,,	,,	S. Continent	70
57	Do	,,	,,	N. Continent	...
58	Sago Flour	,,	Singapore	U. S. A.	170
59	Do	,,	,,	Continent	1,150
60	Do	,,	,,	Glasgow	200
61	Gambier	,,	,,	Glasgow	100
62	Gambier	Str	,,	U. S. A.	...
63	Flake & Pearl	,,	,,	,,	...
64	Cube Gambier	,,	,,	,,	
65	White Pepper	,,	Singapore	,,	...
66	White Pepper	,,	Penang	,,	...
67	Pineapples	,,	Singapore	,,	
68	Gambier	,,	,,	S. Continent	
69	Copra	,,	,,	Marseilles	...
70	Black Pepper	,,	,,	S. Continent	
71	White Pepper	,,	,,	S. Continent	...
72	Black Pepper	,,	,,	U. S. A.	...
73	Do	,,	Penang	U. S. A.	...

1,600 tons Gambier } Contracts
470 ,, Black Pepper }

Exports Telegram to Europe and America.

For fortnight ending 30th April, 1904.

Wired at 1 p.m. on 3rd May, 1904.

					Tons.
10	Tin	Str.	Singapore & Penang	United Kingdom &/or	1,401
11	Do	,,	,,	U. S. A.	1,250
12	Do	,,	,,	Continent	210
13	Gambier	,,	Singapore	London	...
14	Do	,,	,,	Liverpool	...
15	Do	,,	,,	U. K. &/or Continent	250
16	Cube Gambier	,,	,,	United Kingdom	40
17	Black Pepper	,,	,,	,,	60
18	Do	,,	Penang	,,	140
19	White Pepper	,,	Singapore	,,	20
20	Do	,,	Penang	,,	...
21	Pearl Sago	,,	Singapore	,,	70
22	Sago Flour	,,	,,	London	20
23	Do	,,	,,	Liverpool	
24	Tapioca, Flake	,,	Singapore & Penang	United Kingdom	210
25	Do Pearl	,,	,,	,,	150
26	Do Flour	,,	Penang	,,	650
27	Gutta Percha	,,	Singapore	,,	40
28	Copra	,,	Singapore & Penang	,,	...
29	Buffalo Hides	,,	Singapore	,,	20
30	Pineapples	,,	,,	,,	4,500
31	Gambier	,,	Singapore	U. S. A.	430
32	Cube Gambier	,,	,,	,,	20
33	Black Pepper	,,	,,	,,	410
34	White Pepper	,,	,,	,,	60
35	Black Pepper	,,	Penang	,,	...
36	White Pepper	,,	,,	,,	
37	Nutmegs	,,	Singapore & Penang	,,	57
38	Flake and Pearl	,,	,,	,,	700
39	Pineapples	,,	Singapore	,,	750
40	Do	,,	,,	Continent	1,250
41	Gambier	,,	,,	S. Continent	10
42	Do	,,	,,	N. Continent	50
43	Cube gambier	,,	,,	Continent	50
44	Tapioca Flake	,,	Singapore & Penang	,,	70
45	Do Pearl	,,	,,	,,	170
46	Copra	,,	,,	Marseilles	50
47	Do	,,	,,	Odessa	100
48	Do	,,	,,	S. Continent	340
49	Do	,,	,,	N. Continent	540
50	Black Pepper	,,	Singapore	S. Continent	90
51	Do	,,	,,	N. Continent	30
52	White Pepper	,,	,,	S. Continent	...
53	Do	,,	,,	N. Continent	20
54	Do	,,	Penang	S. Continent	..
55	Do	,,	,,	N. Continent	30
56	Black Pepper	,,	,,	S. Continent	...
57	Do	,,	,,	N. Continent	...
58	Sago Flour	,,	Singapore	U. S. A.	220
59	Do	,,	,,	Continent	140
60	Do	,,	,,	Glasgow	
61	Gambier	,,	,,	Glasgow	
62	Gambier	Str	,,	U. S. A.	
63	Flake and Pearl	,,	,,	,,	
64	Cube Gambier	,,	,,	,,	
65	White Pepper	,,	Singapore	,,	
66	White Pepper	,,	Penang	,,	
67	Pineapples	,,	Singapore	,,	
68	Gambier	,,	,,	S. Continent	
69	Copra	,,	,,	Marseilles	
70	Black Pepper	,,	,,	S. Continent	
71	White Pepper	,,	,,	S. Continent	
72	Black Pepper	,,	,,	U. S. A.	
73	Do	,,	Penang	U. S. A.	

900 tons Gambier } Contracts
410 ,, Black Pepper }

Rainfall for April, 1904:—

Government Hill	...	Ins.	15-66
The Prison	...	,,	9-70
The Fort	...	,,	10-04
Balik Pulau	...	,,	13-45
Pulau Jerajak	...	,,	9-00
Lumut	...	,,	11-83
Pangkor	...	,,	10-95
Bruas	...	,,	10-61

M. E. SCRIVEN,

Assistant Surgeon,

Prison Observatory.

Penang, 10th May, 1904.

Table showing the daily results of the reading of Meteorological Observations taken at the General Hospital, Seremban, for the month of April, 1904.

Date.	Temperature of radiation. 9 H	15 H	Mean.	Maximum.	Minimum.	Range.	Temperature of radiation. Sun.	Difference sun and shade.	Grass.	Difference sun and shade.	Wind. Direction. 9 H	15 H	Temperature of evaporation. 9 H	15 H	Mean.	Computed vapour tension. 9 H	15 H	Mean.	Relative humidity. 9 H	15 H	Mean.	Cloud 0 to 10. 9 H	15 H	21 H	Cloud and weather initials. 9 H	15 H	21 H	Rain. Inches.
	°	°	°	°	°	°	°	°	°	°			°	°		in.	in.											
1	81	82	81.5	88	72	16	160	72	67	5	E.	S.E.	74.2	75.3	74.7	.849	.877	.863	80	80	80	0	0	0	B	B	B	.32
2	81	82	81.5	88	72	16	165	77	67	5	S.E.	S.E.	74.2	75.3	74.7	.849	.877	.863	80	80	80	0	0	0	B	B	B	.07
3	82	80	81	88	72	16	165	77	67	5	S.E.	S.E.	75.3	75	75.1	.877	.867	.872	80	85	82.5	0	2	2	B	B	B	.49
4	82	80	81	88	72	16	160	72	68	4	E.	S.E.	75.3	75	75.1	.877	.867	.872	80	85	82.5	0	2	2	B	B	B	.47
5	83	78	80.5	85	71	14	160	75	68	3	S.E.	S.E.	75.3	72.9	74.1	.877	.857	.867	80	89	84.9	0	3	5	B	C	C	.95
6	82	78	80	86	71	15	155	69	68	3	S.E.	S.E.	75.3	72.9	74.1	.877	.857	.867	80	89	84.5	0	3	3	B	C	C	.09
7	82	80	81.5	87	72	15	155	68	68	4	S.E.	S.E	75.3	75	75.1	.877	.867	.872	80	85	82.5	0	2	3	B	B	C	.27
8	82	79	80.5	87	72	15	160	73	68	4	S.E.	S.E.	75.3	72.3	73.8	.877	.793	.835	80	80	80	0	3	5	B	C	C	.07
9	83	80	81.5	87	72	15	160	73	68	4	S.E.	S.E.	78	75	76.5	.956	.867	.911	85	85	85	0	3	3	B	C	C	.07
10	83	82	82.5	87	72	15	160	73	68	4	S.E.	S.E.	78	77	77.5	.956	.926	.941	85	85	85	0	0	3	B	B	C	
11	81	81	81	87	72	15	165	78	68	4	E.	S.E.	74.2	74.2	74.2	.849	.849	.849	80	80	80	2	2	3	B	B	C	
12	81	81	81	86	72	14	160	74	68	4	E.	S.	74.2	74.2	74.2	.849	.849	.849	80	80	80	2	2	2	B	B	C	
13	80	80	80	87	72	15	160	73	68	4	E.	S.	75	75	75	.867	.867	.867	85	85	85	3	3	3	C	C	C	
14	81	80	80.5	87	72	15	160	73	68	4	S.E.	S.E.	74.2	75	74.6	.849	.867	.858	80	85	82.5	3	3	3	C	C	C	.07
15	81	80	80.5	86	72	14	160	74	68	4	S.E.	S.E.	74.2	75	74.6	.849	.867	.858	80	85	82.5	2	3	3	B	C	C	.19
16	81	82	81.5	87	72	15	160	73	68	4	S.E.	S.E.	74.2	75.3	74.7	.849	.877	.863	80	80	80	2	1	2	B	B	B	.07
17	81	82	81.5	87	72	15	147	60	68	4	S.E.	S.E.	74.2	75.3	74.7	.849	.877	.863	80	80	80	2	1	2	B	B	B	
18	80	82	81	87	72	15	150	63	68	4	S.E.	S.E.	75	75.3	75.1	.867	.877	.863	85	80	82.5	1	1	2	B	B	B	
19	80	81	80.5	87	72	15	150	63	67	5	S.E.	S.E.	75	74.2	74.6	.867	.849	.872	85	80	82.5	1	1	2	B	B	B	.03
20	80	81	80.5	86	72	14	150	64	67	5	S.E.	S.E.	75	74.2	74.6	.867	.849	.858	85	80	82.5	1	1	2	B	B	B	.11
21	80	82	81	87	72	15	145	58	67	5	S.E.	S.E.	75	75.3	75.1	.867	.877	.858	85	80	82.5	1	1	2	B	B	B	.27
22	79	82	80.5	87	72	15	150	63	67	5	S.E.	S.E.	75.6	75.3	75.4	.888	.877	.872	85	80	85	1	0	2	B	B	B	.08
23	80	82	81	87	72	15	150	63	67	5	S.E.	S.E.	75	75.3	75.1	.867	.877	.882	90	80	82.5	1	0	0	B	B	B	
24	80	82	81	87	72	15	150	63	66	6	S.E.	S.E.	75	75.3	75.1	.867	.877	.872	85	80	82.5	0	0	0	B	B	B	
25	80	82	81	87	72	15	150	63	66	6	S.E.	S.E.	75	75.3	75.1	.867	.877	.872	85	80	82.5	0	0	0	B	B	B	
26	80	82	81	87	72	15	150	63	66	6	S.E	S.E.	75	75.3	75.1	.867	.877	.872	85	80	82.5	0	0	0	B	B	B	
27	80	82	81	87	71	16	150	63	66	5	S.E.	S.E.	75	75.3	75.1	.867	.877	.872	85	80	82.5	0	0	0	B	B	B	
28	80	82	81	87	71	16	150	63	66	5	S.E.	S.E.	75	75.3	75.1	.867	.877	.872	85	80	82.5	0	0	0	B	B	B	
29	80	82	81	87	71	16	145	58	66	5	E.	S.E	75	75.3	75.1	.867	.877	.872	85	80	82.5	0	0	0	B	B	B	
30	80	82	81	87	71	16	150	63	66	5	S.E.	S.E.	75	75.3	75.1	.867	.877	.872	85	80	82.5	0	0	0	B	B	B	

Total 3.72

J. SHEPLEY PART, M.D.,
Acting State Surgeon.

Singapore.

Abstract of Meteorological Readings for the month of April, 1904.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew point.	Humidity.			
	Ins.	°F.	°F.	°F.	°F.	°F.	°F.	Ins.	°F	%		Ins.	Ins.
Kandang Kerbau Hospital Observatory	29·856	140·7	79·6	86·8	73·7	13·1	76·6	·845	74·5	80	N.W. & Calm.	11·64	2·85

K. K. Hospital Observatory,
Singapore, 16th May, 1904.

A. B. LEICESTER,
Meteorological Observer.

D. K. McDOWELL,
Principal Civil Medical Officer, S.S

Penang.

Abstract of Meteorological Readings for April, 1904.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
	Ins.	°F	°F	°F	°F	°F	°F	Ins.	°F	%		Ins.	Ins.
Criminal Prison Observatory	29·893	144·5	79·6	89·0	73·9	15·1	74·9	·778	70·02	72	N.W.	9·70	1·88

Colonial Surgeon's Office,
Penang, 11th May, 1904.

M. E. SCRIVEN,
Asst. Surgeon.

T. C. MUGLISTON,
Colonial Surgeon, Penang.

Malacca.

Abstract of Meteorological Readings for April, 1904.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew point.	Humidity.			
	Ins.	°F	°F	°F	°F	°F	°F	Ins.	°F	%		Ins.	Ins.
Durian Daun Hospital.	29·849	161·6	79·5	89·6	70·2	19·4	81·4	10·70	70·2	95	S.E.	6·14	3·07

Colonial Surgeon's Office,
Malacca, 26th May, 1904.

F. B. CROUCHER,
Colonial Surgeon, Malacca.

Perak.

Abstract of Meteorological Readings for April, 1904.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature. Mean Dry Bulb.	Temperature. Maximum.	Temperature. Minimum.	Temperature. Range.	Hygrometer. Mean Wet Bulb.	Hygrometer. Vapour Tension.	Hygrometer. Dew Point.	Hygrometer. Humidity.	Prevailing Direction of Winds.	Total Rainfall	Greatest Rainfall during 24 hours.
Taiping ...	...	155	81·28	92	70	22	76·55	850	...	79	...	17·20	4·36
Kuala Kangsar ...	...	...	79·70	92	69	23	75·65	834	...	82	...	10·33	2·63
Batu Gajah ...	...	160	80·74	93	70	23	76·48	857	...	81	...	6·02	·60
Gopeng ...	...	...	79·84	92	63	29	75·88	842	...	82	...	13·96	2·39
Ipoh ...	...	...	80·36	93	69	24	76·20	850	...	82	...	11·83	2·09
Kampar ...	...	...	...	91	69	22	...	...	...	...	..	16·19	3·16
Teluk Anson ...	...	...	80·74	91	70	21	76·35	851	...	81	...	12·96	3·10
Tapah ...	...	...	80·24	92	69	23	76·05	843	...	82	...	8·53	1·63
Parit Buntar ...	...	...	80·98	90	71	19	76·86	868	...	82	...	7·23	2·18
Bagan Serai ...	...	...	80·24	90	71	19	76·05	843	...	82	...	8·88	2·05
Selama ...	...	...	80·93	90	71	19	76·77	865	...	82	...	12·51	1·70

State Surgeon's Office,
Taiping, [illegible] May, 1904.

M. J. WRIGHT,
State Surgeon.

Selangor.

Abstract of Meteorological Readings in the various Districts of the State, for April, 1904.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature. Mean Dry Bulb.	Temperature. Maximum	Temperature. Minimum.	Temperature. Range.	Hygrometer. Mean Wet Bulb.	Hygrometer. Vapour Tension.	Hygrometer. Dew Point.	Hygrometer. Humidity.	Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
General Hospital, Kuala Lumpur	29·849	138·5	79·3	90·1	69·3	20·8	75·8	0·823	73·4	81	S.W.	14·00	3·33
Pudoh Gaol Hospital "	...	...	...	...	...	...	...	...	...	...	...	12·24	2·71
District Hospital "	...	...	...	...	...	...	...	...	...	...	...	11·79	3·20
District Hospital Klang	...	...	...	85·0	74·7	10·3	...	...	...	...	...	6·64	1·75
" Kuala Langat	...	...	...	86·1	70·4	15·7	...	...	...	...	...	5·63	1·70
" Kajang	...	...	...	92·5	73·0	19·5	...	...	...	...	...	8·13	1·30
" Kuala Selangor	...	...	...	86·9	75·6	11·3	...	...	...	...	...	4·69	1.40
" Kuala Kubu	...	...	...	91·1	72·1	19·0	...	...	...	...	...	12·48	2·96
" Serendah	...	...	...	...	...	...	...	...	...	...	...	11·22	4·00
" Rawang	...	...	...	85·5	73·7	11·8	...	...	...	...	...	12·01	2·65
Beri-beri Hospital, Jeram	...	...	...	...	...	...	...	...	...	...	...	14·27	7·45
Ulu Gombah	...	...	...	...	...	...	...	...	...	...	...	8·32	2·31
Sabah Bernam	...	...	...	...	...	...	...	...	...	...	...	3·63	1·43

State Surgeon's Office,
Kuala Lumpur, 13th May, 1904.

E. A. O. TRAVERS,
State Surgeon, Selangor.

Negri Sembilan.

Abstract of Meteorological Readings for the month of April, 1904.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
	Ins.	°F	°F	°F	°F	°F	°F	Ins.	°F	%		Ins.	Ins.
Seremban	...	...	...	...	...	...	...	...	...	...	...	3·72	·95
Kuala Pilah	...	...	...	...	...	...	...	...	...	...	...	6·10	·95
Tampin	...	...	...	...	...	...	...	...	...	...	...	7·39	·90
Jelebu	...	...	...	...	...	...	...	...	...	...	...	7·13	1·10
Port Dickson	...	...	...	...	...	...	...	...	...	...	...	7·20	1·45

State Surgeon's Office,
Seremban, 11th May, 1904.

J. SHEPLEY PART, M.D.,
Acting State Surgeon.

Pahang.

Abstract of Meteorological Readings in the various District of the State, for the month of April, 1904.

District.	Mean Barometrical Pressure at 32° Fah.	Temperature.					Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
		Maximum in Sun.	Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
Kuala Lipis ...	...	...	...	97·5	70·0	22·06	...	...	...	...	...	6·51	1·65
Raub ...	...	...	...	91·0	69·0	17·05	...	...	...	...	...	3·78	1·20
Bentong ...	...	...	...	92·0	70·0	16·27	...		...	...	...	6·02	2·74
Pekan ...	...	...	...	92·0	72·0	14·07	...	...	...	...	...	5·87	1·75
Kuantan ...	...	...	...	85·0	70·0	15·0	...	...	...	...	...	5·25	1·72
Temerloh ...	...	...	...	92·0	72·0	20·0	...	...	...	...	N.W.	6·56	2·35

S. LUCY,
State Surgeon, Pahang.

Kuala Lipis, 25th May, 1904.

Muar.

Abstract of Meteorological Readings for April, 1904.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
Lanadron Estate.	...	...	81	91·5	71	20·5	73	...	...	...	...	7·23	1·44

Muar, 5th May, 1904.

ROGER PEARS.

No. 6.] JUNE, 1904. [VOL. III. PART I.

AGRICULTURAL BULLETIN

OF THE

STRAITS

AND

FEDERATED MALAY STATES

EDITED BY

H. N. RIDLEY, M. A., F. L. S.,

Director of Botanic Gardens, S. S.

CONTENTS.

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NOTICE.

THE SCIENTIFIC AND TECHNICAL DEPARTMENTS OF THE IMPERIAL INSTITUTE.

His Excellency the Governor has received a despatch from the Right Hon'ble the Secretary of State for the Colonies calling attention to the advantages offered by the Imperial Institute to Merchants, Planters and others, who may wish to have samples submitted to scientific experts for opinion as to their commercial value, &c. The following extracts from a Memorandum published by the Authorities of the Imperial Institute will give an idea of the work undertaken and carried on there.

"The Scientific and Technical Department of the Institute has "been established to acquire information by special enquiries and "by experimental research, technical trials and commercial valua- "tion regarding new or little known natural or manufactured pro- "ducts of the various Colonies and Dependencies of the British "Empire and of Foreign Countries, and also regarding known "products procurable from new sources, and local products of "manufacture which it is desired to export. This work is carried "out with a view to the creation of new openings in trade, or the "promotion of industrial developments."

2. In an extensive and well equipped series of Research Laboratories, a numerous staff of skilled chemists under the direction of Professor WYNDHAM R. DUNSTAN, M.A., F.R.S., carry out the investigation of the chemical constitution and properties of new dye-stuffs, tanning materials, seeds and food-stuffs, oils, gums and resins, fibres, timbers, medicinal plants and products, with a view to their commercial utilization. Whenever necessary these materials are submitted to special scientific experts, by whom they are made the subject of particular investigation or practical tests. Reports are also obtained from technical or trade experts in regard to the probable commercial or industrial value of any such products, while full information is collected from official or other trustworthy sources regarding the probable extent and cost of available supplies.

Reports on the results of enquiries or experimental investigations are supplied as a rule, without charge, but should special expenses be incurred in connection with any such reports, or with the commercial value of particular materials or manufactured products, which the Council do not consider themselves warranted in meeting, a statement of such outlays will be furnished, for repayment, when the Reports are supplied. Should an investigation or report of exceptional character be asked for by a Government Department, an estimate of the attendant expenses will be submitted, with a view to ascertain whether authority for such expenditure will be given.

AGRICULTURAL BULLETIN

OF THE

STRAITS

AND

FEDERATED MALAY STATES.

No. 6.] JUNE, 1904. [Vol. III. Part I.

A Review of the Introduction of the Cotton Industry in Netherlands India,

By Dr. K. W. Tromp de Haas.

Reprinted from the "Teysmannia" 14th Annual, 10th & 11th Editions.

By kind permission of Dr. Treub we publish a translation of this important Dutch paper on the cultivation of Cotton in Java. It has been translated by Mr. W. Seelhorst.

Introduction.

The influence of Watt's invention on the intellectual and material development of mankind, is in no way better demonstrated, than by the perusal of the history of two manufactured products, taking one from the mineral and the other from the vegetable kingdom, for instance iron and cotton.

If we follow the histories, of these two products, and note carefully the different stages of progress, the power of human skill, in adapting the uses of one to those of the other, will become evident.

Hail, to the country that is able to produce both the raw materials!

How the cotton industry has been affected, by the power of steam may be seen from the following figures.

From 1790—1850 the production of cotton increased from 1—3 millions of bales and from 1850—1894 from 3—15 millions of bales of 400 lbs. each.

In 1895, the product of the world amounted to 17 millions of bales of 400 lbs. each, representing a value of about one thousand millions guilders. Is it a wonder therefore, in view of these figures, that each individual Country, endeavours to cultivate and spin its own cotton?

Java and Madoera alone import yearly about 30 millions worth of cotton and linen ware.

It need not therefore surprise us, that considering the development of the cotton industry, eyes are set on our colonies in order to profit by the advantages gained by that industry.

An eventual war between the Northern and Southern States of North America would cause a still-stand of the spinneries in Europe owing to the lack of raw material.

Referring to the archives, relating to the Agriculture of the Netherlands Indies, of the beginning of the second half of the last century, we clearly see, that then already great endeavours were made to make our colonies into the chief cotton growing countries.

This old and much cherished hope, is always revived again each time that the price of cotton goes up, and it is only to be hoped, that the Government will take the initiative, to bring about the realization of this hope.

In order to see to what an extent this hope may be nourished, and before enticing people to undertake experiments on a somewhat large scale, it will be useful to gather together, notes of all that has been done, here and elsewhere and to see what lessons are to be derived from them.

A brief review of the cotton industry in general may be of use to, thoroughly convey to the mind the chances of success.

History.

It is impossible to trace the time when the cotton fibre was first used in a woven state.

No matter how far we go back in the history of mankind, we find everywhere mention made relating to cotton.

The Hindoos and Aztees, natives of India and America were already acquainted with it. In the year 2,300 B. C., the time of Emperor Yoas, the sons of the Heavenly Kingdom wore cotton clothes.

The Egyptians used linen and cotton cloths * to wrap round their mummies.

Mention is also repeatedly made in the Biblical History, of cotton fabrics. One of the Pharaohs presented Joseph with a cotton dress.

It was through the conquering journeys of Alexander the Great, that cotton cloth was first introduced to the Greeks and Romans of which only the richest made use. The Arabs brought over cotton to the South of Spain. It is supposed that India is the original native land of the cotton plant. America can also lay a claim to this, for when the Spaniards conquered Mexico, they found the cotton plant there, and that the natives generally used its product as wearing apparel.

It is difficult to explain, how it got thither from India.

Botany.

The cotton plant belongs to the family of *Malvaceæ* and to the genus Gossypium. It is a native of the tropics, where it flourishes

* The presence of cotton can be easily detected by the structure and chemical appearance of the fibre.

luxuriantly on the islands and sea-coasts. Through the art of cultivation it is possible to rear the plant up to 40° northwards as well as southwards. In America it can be reared with advantage up to 37° northwards.

The plants belonging to the genus *Gossypium* are of a tree-like as well as shrub-like nature. They have a root penetrating deep into the ground. The boughs bear from 3 to 5 sometimes also 7 lobed, more or less petioled, large leaves.

The straight- growing cylindrical stems have a dark reddish coloured bark, and a white skin, and bear a wide, out-spread crown. The round or sometimes rough boughs grow straight, and spread out; cultivated plants have these short.

The structure of the flowers and fruits growing on the branches, of the different kinds have much mutual similarity.

The three large outermost, heart-shaped sepals, parted on their extremeties, surround a short fringed five-sided cap.

The fine large petals are mostly yellow, (only those of *Gossypium hirsutum* are white) after opening they become reddish.

The fruit has from 3-5 cells each containing a certain number of seeds.

On the whole surface of these seeds, long hairs (the cotton) develope which always remain single-celled and attain a length of from 4-5 c.m., as in the Sea-island cotton.

On the bursting of the ripe fruit, these hairs bulge outwards in clusters.

In some kinds of Gossypium the seeds, besides being covered with the mentioned hairs forming the cotton, are covered with a felt-like mass; as for instance in *Gossypium herbaceum*, etc.

In other kinds, such as; *G: barbadense*. L. and *G: peruvianum*. Cav. this covering is wanting. In those cases and especially in *G: barbadense*, the hairs (the cotton) are easily removed which is of great advantage in collecting it.

On the removal of the hairs, there remain the hard, black and smooth seeds. In those kinds of Gossypium, whose seeds have the above mentioned felt-like covering, the hairs (the cotton) are difficult to separate from the seeds.

In consequence of the great tendency to vary which these species have it is difficult to determine their number. Linnaeus describes three kinds, but since then this number has increased considerably.

The "*Index Kewensis*" mentions 42 names, of which however only a few have a specific meaning. It also makes mention of 88 kinds, which are since looked upon, by it as synonyms.

The great variability and inclination to hybridize make it very difficult to specify a plant of this kind.

No plant answers more quickly to improved growth-conditions than cotton.

The most widely spread are 4 kinds which differ from each other in the following way.

A. Besides having the long seed-flocks (cotton), a yellow felt-like covering over the seeds:—

I *Gossypium herbaceum*. *L*. (Indian cotton) with 3-5 seldom 7

lobed leaves, yellow flowers and a large calyx, which is about the same length as the fruit, from 5-7 seeds in each chamber, the long seed-hairs are 2-2, 8 c.m. long.

II. Gossypium hirsutum. L. (Upland cotton) with strongly haired leaves and flower stems, 3-5 lobed leaves, where the lobes reach about half way down the leaves, smooth fruits and from 6-8 seeds in each chamber. The long hairs have an average length of 2-5 c.m. This kind is of greatest importance for America. The produce of cotton in America consists chiefly of this kind.

B. Only seed hairs and no felt-like covering over the seeds.

III. Gossypium barbadense. Z. (Sea-island cotton, the best kind of cotton) with 3-5 lobed leaves yellow flowers, and 6 loose seeds in each chamber. Seed hairs to 5 c.m. long.

IV. Gossypium peruvianum. Cav. (*Syn: G: religiosum. Plt.*) South American cotton up to 5 m. high with big from 3-5 lobed leaves white flowers and from 5-10 seeds in each cavity which are connected with each other. Seed hairs up to 3-5 c.m. long.

All these Gossypium kinds are over-one-year plants but G. herbaceum is the only annual plant, outside tropical zones.
G: arboreum. L. which will be mentioned later reaches a height of from 5-7 m. As a culture plant this kind has not been much used.

According to TEYSMANN, there are three kinds of cotton in Java of which many varieties are known.

He divides the cotton into yearly and shrubby or limited-growth cotton varieties. This classification is more of an artificial nature and rests more on a practical than a scientific foundation as, as is already mentioned above, all kinds of cotton with the exception of *G. herbaceum*, grown outside tropical countries, may be considered as plants of limited growth. But, in fact in practice only perennial kinds are reared as annuals.

To the annual kinds to be found here, TEYSMANN reckons:—

I. *G. indicum.* Lam, *G. herbaceum.* L., one and the same species.

II. *G. religiosum.* Sw.

III. *G. barbadense.* L.

and to the shrub-like kind or limited-growth cotton kinds, the following pair:—

IV. *G. vitifolium.* Rxb.

V. *G. micranthum.* Cav.

According to later systems, *G. religiosum* and *G. vitifolium* should be varieties belonging to *G. barbadense* and *G. micranthum* belonging to *G. herbaceum* or *indicum.*

As in some other plants which have been cultivated for a considerable time it is also the case with cotton that the systematic varieties and kinds are difficult to determine.

However it may be from TEYSMANN'S investigations, it is clearly seen that in our archipelago besides the inferior also the best kinds are cultivated.

The best varieties are those which come under the species *G. barbadense.*

TEYSMANN considers as belonging to *G. indicum* or *herbaceum*—

1. The so-called Kappas djawa, which is also called K. Koema, K. gaga, K. kuras, and which is generally cultivated in Java, the Tegal-lands and Sawahs.

2. Out of Java, in the neighbourhood, is cultivated of this cotton kind. Kappas Palembang. This kind is chiefly grown in the districts of Palembang and Lambong and is there known under the name of Kappas ogan, K. oeloe (ulu). This cotton feels rough to the touch and is chiefly exported to China.

3. Cotton from the West Coast of Sumatra comes from the V. Kottas. TEYSMANN doubts whether this kind really differs from No. 2.

4. Kappas Dakka formerly imported into Java from Bengal. From this kind the Dacca muslin is made, and this is considered the best variety.

5. Kappas mera was formerly accidentally found in a garden in Batavia. This closely resembles Dakka cotton, with this difference that the whole plant, stem, leaves, flowers and fruit has a reddish appearance. It cannot be cultivated with advantage.

6. Kappas hoema besar, coming from Bali, also found in Java. Does not seem to be recommended for cultivation.

The named kinds of which 1 and 2 are here mostly grown do not actually die after the first full crops, but they begin to yield scantily and pine and their product is small and of inferior quality.

Under *G. religiosum.* Teysmann classes—

1. New Orleans, grows well in Java and Palembang, was imported from North America.

2. Siam, Cambodja or Cochin China cotton.

3. Nankin cotton, compared with the above-mentioned cottons this is of a yellow colour.

Of *G. barbadense.* are imported into Java according to Teysmann

1. Sea Island cotton from North America.

2. Egyptian cotton, (imported by the Netherlands Trading Society.)

These kinds are faster in their growth than those of *G. indiium.* and more resemble the shrub-like cotton of *G: vitifolium.* The seeds are easily separated from the cotton.

As already mentioned they belong to the best and most oughts-for kinds of the shrub-like cotton only the above two are known here.

G. vitifolium, is known under many names such as, Nierzaad, Pernambuco, Brazilian, Guiana, Cayenne, Demerara, Berbiex Essequibo, Surinam, cotton de pierre, kidney and link cotton and in this archipelago as, Kappas Kosta, K. Kompa, K. besar, K. Kling, K. agries, K. Sanu etc, the last name is also used for the annual *G. indicum.* Of this one variety is known (K. Kompa) with sulphur yellow flowers, and a dark coloured centre while the first kind is light yellow and the dark colour in the centre is wanting.

Gossypium vitifolium is the biggest kind known here and attains a height of 12 feet.

Of all the above mentioned the Gossypium barbadense and New Orleans kinds, deserve, according to TEYSMANN's verdict, the most

encouragement in order to replace the short (native) kinds of Gossypium indicum, as their product is superior both in quality as well as quantity, to that of the last named.

If we bring TEYSMANN'S classification in accordance with the latest views, that is the 5 principal kinds, *G. barbadense*. L. (Sea-island cotton); *G. peruvianum*. Cav. (*G. religiosum*); *G. hirsutum*. L. (Upland cotton); *G. herbaceum*. L., (*G. indicum*. L.) and *G. arboreum*. L. (tree-like cotton) then that which TEYSMANN calls *G. religiosum* must be *G. hirsutum*, and that which is described by him as *G. vitifolium* must be *G. peruvianum*.

Whether the native kinds of cotton can be replaced by those which offer planters better advantages is a question which we may well ask ourselves.

It is not sufficiently satisfactory from an economical point of view to satisfy ourselves as to the similarity of the conditions of growth with those of the land from which the cotton is imported. It is true that it is a prominent factor, but the others, capital, labour, transport etc., are of equal if not greater importance, to the production as the growth conditions which are unsuitable can be modified if they are not favourable.

The special remarks concerning this we will postpone at present, but later on will find an opportunity to view this point closer.

CONDITIONS OF GROWTH.

The cotton plant requires an atmosphere containing a lot of moisture. It likes chiefly sunshine during the day and dew at night. Heavy rainfalls are harmful to it, both in the first, and in the last growing stages. If they happen to fall in the harvest time, they may do great damage.

Occasional mild showers followed by sunshine are good from the beginning to the blossom time. A want of rain can be remedied by artificial irrigation. If this is not possible then the rainfall in the first 3 months must amount to at least 75 m. m. per month. Later on the dew may be able to completely replace this.

A proof that the cotton and this is especially the case of the finer varieties, grows best in tropical countries with a medium rainfall may be seen from the rainfall tables of the cotton growing countries in America which are given below :—

Months.	South Atlantic territories.	East and West Gulf territories.		Rio Grande Valley.	Ohio Valley and Tennessee.
	m.m.	m.m.	m.m.	m.m.	m.m.
January -	107	130	96	31	104
February -	91	120	86	27	103
March -	110	165	95	28	101
April -	98	137	100	17	95
May -	95	112	119	69	90
June -	130	125	96	54	118
July -	147	120	95	40	109
August -	161	116	78	78	91
September -	133	96	133	150	70
October -	104	67	105	88	68
November -	97	105	112	41	86
December -	103	123	104	39	91
Total -	1.358	1,407	1,219	654	1,126

How it stands with the rain divisions during the growing time of the cotton may be seen from the tables (to follow) borrowed from America which refer firstly to the whole cotton growing country and in particular to the two chief growing states, Texas and West Louisiana.

Egypt, where an even better quality of cotton is cultivated than in America, has, compared with that country, a very dry climate, which may be seen from the following rainfall observations made in Alexandria and in Cairo.

	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Total.
	m.m.	m.m.	m.m.	m.m.	m.m.	m.m.	m.m.	m.m.	m.m.	m.m.	m.m.	m.m.	m.m.
Alexandria ...	82.6	0	4 0	0	0	0	0	0	14.3	30.0	30.5	56.6	188
Cairo ...	22.8	1.7	0	0	3.5	0	0	0	0.0	5.0	0	4.6	33

With these small quantities of rain it would seem to be impossible to grow cotton in Egypt if it were not that artificial irrigation remedies this want.

The Nile makes Egypt independent of the weather changes. No rains or droughts endanger her harvests so that little risk is connected there with the cultivation of cotton.

The cultivated cotton plant requires a growing time of from 4¼ to 5½ months according to the kind and to the climate, on the average 5 months.

It is not simply grown as an annual but as a perennial plant which can only be done exclusively in forest-free places. But the cultivation of this is less profitable, as the second and subsequent crops decrease in quality as well as in quantity.

The cotton plant requires for its vegetation a temperature of 18°C. This must never fall to O°C. Shade does not suit the plant.

As regards the soil cotton is grown with more or less success on nearly all sorts of soil. It is grown on light sandy soil, heavy clay soil, sulphur-bearing soil etc.

On the higher lying sandy soils, the harvest of cotton is generally small, on heavy clay soils, especially in wet seasons the plants attain large dimensions but the produce of fibre is not proportionate.

It is an established experience that cotton growing on these extremes of soils, suffers more from disease and plagues, and from unsuitable temperatures than otherwise. If the temperature is suitable and other factors good, then the heaviest clay soils yield the biggest harvests.

The light clay soils may be looked upon as those yielding the surest harvests.

The soils of South Carolina which may be taken as a model of the best cotton soil consist of from 25–30 % of clay. At the time of growing they contain from 10 to 12 % of moisture.

The Sea-island cotton, the best kind grows on very different kinds of soil but the best for it is light fine-grained sandy soil which has from 75 to 90 % of fine sand. It contains during the growing-time of the cotton about 5 % of moisture. The percentages of the moisture in the soils are of great importance to us.

It seems to us though that there are to be found here, fairly few soils, which have even in the driest mouths such a low percentage of moisture, as those cotton lands in America of which mention has just been made above.

During the severe drought of 1902, when the leaves of different plants in the Agricultural Gardens were drooping, we found that the soil on which those plants were growing still shewed the following percentages of moisture :—

At a depth of	3	c. m.	18.4	%.
,, ,,	25	,,	22.2	,,
,, ,,	60	,,	24.8	,,

	June.	July.	August.	September.
No. of rainy days over the whole cotton territory ...	10–14	9–16	5–15	8–12
Texas and West Louisiana	5–8	4–10	5–11	5–12
No. of dry days over the whole cotton territory ...	6–12	8–14	8–15	9–15
Texas and Louisiana ...	9–20	11–19	11–16	11–17
No. of partially clouded days over the whole cotton territory ...	13–16	12–17	12–18	10–13
Texas and Louisiana ...	12–16	9–15	11–14	9–13
No. of cloudy days over the whole cotton territory ...	5–10	6–8	4–9	5–10
Texas and Louisiana ...	1–6	3–5	3–6	4–8

If it is intended to introduce the finer Ameri an kinds of cotton, elsewhere, then it is advisable to consider beforehand whether they would not be put under too different climatic conditions. If we adapt our own archipelago to these conditions, then it becomes evident that there are few places there, which could come under consideration. It seems to be clear that in Palembang, the land of cotton in our archipelago, there is a lot of risk connected, with the cultivation of the mentioned kinds of cotton when we consider the rainfall there. The driest months for Palembang are, according to the "Rain observations in Netherlands India" (and these on the chief places), May, June, July, August and September with respectively, 14, 11, 9, 10, 10 rainy days; with respectively, 194, 134, 108, 110 and 131 m. m. of Rainfall. The quantity of rain in the sowing and harvest months is thus here greater than in America.

To what extent good cotton soil must contain nourishing mineral contiuents is difficult to determine with the material at present at our disposal.

As long as we have no better insight into the quantities of plant-food (which the plants take up) which are present in the soil it is not possible to quite strictly determine the limits. Soils with less than 0.05% phosphoric acid must be considered as very poor in that constituent, unless they have a sufficient amount of lime, to make up for this want.

Sandy clay soils containing 0.1% phosphoric acid and a sufficient quantity of lime are sufficiently productive for a period of from 8-15 years.

If lime is not present in sufficient quantities then the percentage of phosphoric acid present must be at least twice as much. The best valley soil of the Mississippi contains 0.3% phosphoric acid, and the so-called Black-Earth has 0.46%. The red clay soils of Tennessee are foremost in that respect with 0.563%. As to potash, with 0.56 the limit is reached so that potash manuring must be considered a necessity.

The soils of the fruitful valley of the Mississippi contain 1.3%, other heavy clay soils contain from 0.8-0.5%, light clay and sandy soils contain, even up to a considerable depth not less than 1% of this constituent and 1.4% of lime.

The soils of the South of the United States are generally rich in potash and therefore seldom need manure containing enough of that substance.

Not much importance is to be attached to potash if the soils are rich in phosphoric acid and lime.

No manure was used in America before the War of Independence. After the liberation of the slaves many good workmen became free, who threw themselves into agriculture and specially busied themselves with cotton growing. From that time to the present day, concentrated manures are employed in the cultivation of cotton in the United States, with the exception of a few places where the virgin soil is used and in the alluvial soils along the great rivers.

Perhaps on no other agricultural product has manure exercised such influence. Not only because with the assistance of manure, paying results were possible from soils which would otherwise have been unsuitable for cultivation, but the good effect of manure, manifests itself also in this respect, that the growth of the cotton plant is quickened, and thereby the limits of its area of cultivation is pushed further northwards.

And that no small amount of manure is used is seen from the fact that in the states of South Carolina and Georgia one lot of manure, consisting of 60 kilos phosphoric acid, 18 kilos Nitrogen and 18 kilo grammes of potash is usually used per bouw. This is generally given in this form :—

Hypophosphate	410 k.g.
Chili Saltpeter	115 ,,
Potass Chlorate	100 ,,

One lot costing about *f.* 40.

The only place where cotton is grown without any manure, is on rich alluvial soils. And even in these cases some manure is used as in the fruitful alluvial soils of Egypt, which continually receives the mud of the Nile, where 17—26 M^3 of stable manure are used per bouw.

Culture and Harvest.

In order to get a good insight into the Cotton culture, we can do no better than to consider here shortly the states which exist in North America, the land which cultivates the most cotton.

The difference between here and there will then become more evident.

The cotton culture of North America covers an area 24 longitude and 15 latitude degrees, giving an area of more than 1.56 million square milimetres or more than $1/3$ of the United States or three times the size of the German Empire. It has a population of more than 8,000,000 whites and more than 5,000,000 natives, a total of about 13,000,000 of which each 100 produce 53 bales of cotton, or 250 lbs. of fibre per head.

The Mississippi River divides the cotton country into nearly two halves, lying east and westwards of it.

The ground on which cotton is grown is determined according to the geological state or condition. Accordingly the country is divided in the following: The Pine Levels; The Pine Hills; The Metamorphic or Piedmont Territory; The Sand Hills; The Prairie Territory; The Oak and Hickory Territory; The Bluff and Brown Table Lands; The Alluvial Territory; The Valley Territory; and The Alpine Territory.

The Pine-Levels, stretch from the Atlantic Ocean and the Gulf of Mexico, from 50-150 miles landwards and attain a height of 200 feet above the sea-level, covering an area of 19,000,000 bouws, of which 44 % consist of cotton land. The production is from 26 to 32 % of the total.

The average size of a cotton farm is 68 bouws, but the farms here are larger being 110 bouws.

Of these farms about 69% are worked by their owners while the remainder are let out. The tilling of the land here is easy, for 21 bouws, one requires only 1 draught animal while on the average one animal is necessary for 12.5 bouws.

Three bales (1,500 lbs.) are produced by each animal (which is high as this number is put to 2.1 bales for each animal, for the whole territory. The soil of this territory has the greatest need of proper irrigation. On these lands, the Sea-Island cotton, in South Carolina and Georgia, is grown.

The Pine-Hills, border on the Northern boundaries of the Pine-Levels, attaining a height from 200-400 feet above sea-level. They cover an area of 22,300,000 bouws of which 58% is cultivated land, yielding a product of 15% towards the total. In Georgia and South Carolina mules are used for the work, but in Missisippi, Louisiana and Texas where Europeans are predominant horses are employed. Here 19 bouws require one animal.

The Metamorphic or Piedmont Territory, borders on the northern bounds of the Pine Hills, passing through North Carolina, South Carolina Georgia and Alabama. It covers an area of 18,800,000 bouws of which only ten percent are cultivated with cotton, its product adding 16.8% to the total. The smallest farms have an area of 30 bouws and are 40% of all the farms. Here they count 20 bouws to one animal, with an average production of 3.7 bales. The value of one bouw of land is ƒ37. The cost of producing a pound of cotton is 17 cts.

Between the Piedmont territory and the Pine Hills lie the Sand

Hills, a piece of land of the size of 3,400,000 bouws lying on a height of from 500--800 ft. of which 66% is farm-land, five percent of it being planted with cotton. Its share of the cotton production is 1.6%.

The Prairie Territory, includes the black prairie land of Alabama, Mississippi and Texas and further more the coast prairies of Arkansas and the red clay soils of the prairies of West Texas. This territory consists of an area of more than 37,000,000 bouws of which 55% is farm-land with a contribution of 20.6% to the total cotton production. One has to deal here with clay soils. The land has a value of from 24 to 53 guilders per bouw. In this part the most use of implements is made the planting year begins with the first of December, one month earlier than in the East. The ploughing of the cotton land is done mechanically. The ploughs are chiefly drawn by two horses. The ground here is so much heavier than in the Pine levels. The more or less hard prairie soil is ploughed with 4—8 horses when 1—4 bouws are able to be ploughed to a depth of 5—20 c. m. in a day.

The soil here is so fruitful that it is on the whole not necessary, to use manure. If the soil has been worked for some years, it becomes easier to manage.

The plucking requires a great expenditure. The best pluckers gather from 500-600 pounds of cotton per day. Children from 6-9 years pluck on the average 100 lbs. per diem.

The cost of production amounts to from 12-16 cents per lb. The field labourers' wages are high, in Texas.

On the 250,844 farms, there are about 57,042 labourers. These get on an average including food and housing *f* 33 per mensem.

The Oak and Hickory Territories, lie on the Eastern border of the Black Prairie lands of Texas having an area of 24,600,000 bouws of which about 52% are farmed yielding 14.4% of the whole cotton harvest.

Of its farms, 31-34% consist of less than 30 bouws. For 20 bouws, one draught animal is considered sufficient, The value of the ground is *f* 25 per bouw.

The Bluff and Brown Loam Table Lands, lie towards the East of the Mississippi river, with an area of 6,300,000 bouws and a product of 6.8% of the total. The value of this ground is on the average 40 guilders per bouw, and the average cost of production is estimated at 17 cents per lb.

The Alluvial Strips, are met with in every southern State, generally, the low lands along the Mississippi, the Red and Brazos rivers are meant with these. These consist of a total area of 17,000,000 bouws, of which 34% is farm land. Six percent of this is cultivated with cotton giving 14.6% to the total

The ground is chiefly let out at from 13 to 23 guilders per bouw, the while the average value of the land is estimated at *f* 64 per bouw.

The Red-Loam Lands, lying on the east and west coasts of the Mississippi River and the valleys of the South East of Tennessee and the North-west of Georgia, produce together 6.8% of the

total; the while the *Alpine Regions* which are met in North and South Carolina, Georgia, Tennessee, Arkansas and Texas produce 0.9% of the total cotton production.

Of the total cotton production in 1894, the product of each different State was as follows:—

Texas	-	33.1%
Georgia	-	13.2 ,,
Mississippi	-	12.1 ,,
Alabama	-	10.1 ,,
Arkansas	-	8.6 ,,
South Carolina	-	8.0 ,,
Louisiana	-	6.0 ,,
North Carolina	-	4.7 ,,
Tennessee	-	3,5 ,,
Florida	-	0.6 ,,
Remaining states		0.1 ,,

The production in 1893 were for;—

North Carolina	-	294 lbs.
South Carolina	-	294 ,,
Georgia	-	294 ,,
Alabama	-	350 ,,
Mississippi	-	332 ,,
Louisiana	-	448 ,,
Texas	-	418 ,,
Arkansas	-	329 ,,
Tennessee	-	289 ,,

or an average of 339.5 pounds of cleaned cotton per bouw.

It is of consequence to us to know what the cost of production thereof amounts to.

The growing of cotton is in America nearly unlimited, as there is there no lack of land and labour.

From the given figures, referring to the differences between, the total area of farm-land, and the area of the different lands cultivated with cotton, may be seen how the latter can be considerably enlarged. Of the vast prairies there is left over 55% of farm-land of which the greatest part is suitable to cotton growing.

If the cotton prices* rise the consequence will be that waste land will be made capable of a profitable undertaking. The production is governed by capital and labour.

The growing conditions are there so advantageous, that little capital need be expended, for improving the land and manuring. It may be said that $1/5$ of all the horses and mules on the farms are sufficient for the biggest possible harvest.

The quantity of cotton which can be produced is determined by

* The increase of the price of cotton is not always the result of an increase of consumption but sometimes is urged on by speculators. The planter tempted by the high prices and not suspecting the actual cause of the rise, thinks that the moment is of advantage to put labour and capital in the cotton industry. This does not last long, and before long the actual cotton prices are again paid, when the new planter finds to his loss that he acted too rashly.

the size of the land that can be tilled by one draught animal between the 5th of May and the 1st of August.

This is estimated at 20 bouws.

The keeping of one horse, with the necessary implements, harness and insurance is estimated at *f*305 annually of which *f*135 go to the account of the planting.

For ploughing *f*160 and for weeding and banking *f*138 are paid per 20 bouws.

The produce of 930 lbs. of raw cotton per bouw (including seed, waste, etc.) is equivalent to 310 lbs. of cleaned cotton, then the cost of harvesting amount to *f*183 per 20 bouws.

If manure is used one reckons an extra expense of *f*7.79 per bouw, thus for 20 bouws *f*155.80. Rent and administration cost *f*6.56 per bouw, or per 20 bouws *f*131.20. The total cost of production is thus for 20 bouws 903 guilders, or × 45 guilders per bouw or per lb. of raw cotton 4.84 cts. or per lb. of clean cotton 14.5 cts.

This refers to the cotton territories to the east of the Mississippi. For the west where the cost of production is cheaper, the cost price of one lb. of clean cotton is put at 14.2 cts.

To this must be added the cost of cleaning and packing, but this is largely covered by the value of the cotton seed.

Fifty-four per cent. of the total cost come from the labour, which, compared with other industries, is very high, and as this figure is about 27 % in the cotton mills, the conclusion must be drawn, that labour in the cotton industry of America is a prominent factor.

It is interesting to compare with these figures the cost of production in Egypt and India.

For Egypt these amount to *f*170.63 per bouw, or, with an average production of 600 lbs. per bouw, 28.3 cts. per lb., about four times as much again as in America.

The Egyptian planter would not be able to exist, if his harvest per bouw were not better and his sale-price moreover higher.

In the North West Provinces of British India, the cost of production amounts approximately to *f*31.76 per bouw. The average produce of cleaned cotton is 190 lbs. per bouw, the cost of production therefore amounts to 16.6 cents per lbs.

We will here shortly sketch those cotton-growing states of America, which specially grow Sea-Island cotton.

On the sea-islands of South Carolina the field work is exclusively done by natives, of whom most are employed in farming. A large portion of them are owners of farms, but a still larger portion rent the ground, while, land is given to the actual workers in exchange for their labour.

The greatest area of land, actually cultivated with cotton by one owner, is not more than 57 bouws.

The white farmers have usually not more than 17 bouws planted with cotton. Such an area always necessitates their being owners of large stretches of land, as they have to pay for 2 days work in the week with 3–4 bouws; for which they can then have about 2 bouws of land, planted with cotton, so that if they want to

have 17 bouws planted with cotton, they must have at least 43 bouws of cotton land at their disposal. And as they grow other plants as well the whole amounts to 70 bouws.

If it is then also taken into consideration, that in the case of that system the land is only planted once in 2 years, then such an owner must have at least 140 bouws of farm land.

Mules are used for ploughing, digging, weeding etc. One mule is considered sufficient for 17 bouws; as has been already mentioned above, the land consists of very light, sandy soil.

The preparation of the soil, before the planting of the cotton, is begun with the removal of the weeds, and the cutting up of the cotton roots of the last harvest, after which these are heaped up and set fire to. All this work costs about 2 guilders per bouw. The uprooting costs *f*0.35 per bouw.

The land is not altogether ploughed, but in February two furrows are ploughed, between the cotton beds in such a manner, that a trench of 17.5—20 c.m. is formed. Sometimes this trench is worked with an underground plough. Into these trenches the manure is put, consisting of 35 cartloads of mud and 900—1,200 *k.g.* of cotton seed.

Mud and stable dung are also used, the latter in quantities of 70 cartloads to the bouw. Sometimes other dung is added to the stable dung.

When that has been done, then the above mentioned furrows are ploughed, from the edges of the old cotton beds, which costs *f*0.75 per bouw.

With a double roller weighing about 400 *k.g.* the mass in the two furrows is simultaneously pressed hard. All this work must be ended by the beginning or the middle of March. The cotton-bed is then raised higher by ploughing. It is of the first importance that the cotton should be in a good dry position.

If the soil contains too much moisture, the growth and product are not up to the mark.

For this reason the soil is properly drained. The old open drains are gradually closed and replaced by new ones. Though this may seem expensive, it has proved to be cheaper than the old system of drainage.

The ground is now ready for planting, which may be begun at any time after the 20th of March, but preference is given to the time between the 1st and the 10th of April.

Three labourers do this work. The first man digs small holes into the top of the bed, with a spade, at distances of from 30–45 c.m. long and 1.20 m. broad. The next drops 8–10 seeds into each hole and the third covers them up. The seeds lie about 2 c.m. deep. From 200-250 litres of seeds are used per bouw. Instead of planting in little heaps, the method of planting in rows is used in America. The rows lie 135 c.m. from each other and with a special sowing machine, the seeds, 5–6 together, are put out into these rows at distances of 10 c.m. Later on they are thinned to equal distances of 40 c.m. The plants appear 8–12 days after sowing. The weeding is begun about the first of May, and for the second

time at the end of that month, then the earth is also heaped up again.

This is done by going through the new beds, first with the shovelling machine, and then the earth is heaped up with the plough. By earthing up the cotton is pressed tighter into the ground and the weeds suppressed. This costs f3.50 per bouw.

At the second time of cleaning a beginning is made with the thinning and this is repeated each successive time that the ground is weeded, so that in July only one plant remains in each spot. In all there are four cleanings.

Near the end of July nothing more is done to the plantation, with the exception of ploughing between the cotton rows in August.

The first flowers appear, towards the middle of June, when the plants are about 40 c. m. high and in August the fruit open, the plants having then attained a height of 1.50 m.

The plucking begins in the last week of August and continues to the first week of September. The harvest is ended about the middle of December.

When the cotton has been plucked, weighed and cleaned, then it is dried in the sun on platforms of about 8 m. square.

If this precaution is not taken, it may happen, that the stored cotton becomes heated. It is also said that by drying in the sun, the fibres obtain a more silky appearance owing to the absorption of oil from the cotton seed.

After the cotton is dried it is stored or treated with the flock-mills. Before this however, it is cleaned by hand from rubbish and dirty cotton.

As a day's work one man has to produce 150 lbs. of cotton seed. Now the cleaning is done more carefully and the above mentioned task is given to two persons. One cleans the cotton before it goes through the flock-mills and the other after it has left them.

In the remainder of America the following general rules are considered :—

In territories that are not drained, and that is the case of most instances, the cotton is grown on ridges, from 5 to 8 c. m. high, in distances from 20–35 c. m. broad and 120 c. m. long, this has already been mentioned above.

Besides the plough much use is made of shovels or spades. The proper use of the latter especially contributes much to the good results of the culture.

The number of seeds put into each hole, (one foot apart) is 5–6. In very dry climates the cotton is planted deeper than elsewhere. Starting with 10 c. m. distances, this is thinned to the distances above mentioned. At the time of growing care is taken to destroy the weeds and that the top layer of the soil remains crumbly, to facilitate the air drying of the soil. When necessary the sides of the beds are heaped up once or twice.

The cotton plant seems to be well able to bear the cutting of its roots so that there is no cause for anxiety when weeding, of injuring the roots with the tools.

The planting is done between the 1st of March and the 10th of

June and a start is made with the plucking between 10th July and 10th October.

Singular characteristics, concerning the growth in South Carolina are shewn by the following:—

Of 100 seeds, planted 10 per hole one foot apart, on 29th March, 24 sprang up, of which again 2 died, 39 could not be found again, perhaps these were eaten by insects, 23 had rotted, and 14 seemed good but would not vegetate.

The first plant made its appearance 14 days after planting and the rest followed within 18 days and after thirty days no more came up.

The climate was cool and moist. In very dry climates the seeds can remain in the ground from the 1st April to the 10th of June and still come up well.

Eight days after the seeds had sprung up, or 23 days after sowing the third leaf appeared. The fourth leaf shewed itself on the following day.

The first bud was visible 41 days after the seeds had sprung up or 53 days after sowing, and 25 days afterwards it blossomed.

The capsules visible on the 25th May burst open on the 9th of August.

If the weather is not suitable in the fruiting season, the cotton plant which is then weak shews the greatest sensibility. Then the buds, blossoms and half-grown fruits fall off.

The following statement coming from the same source as the above, shews the losses, which unsuitable weather can cause:—

Month of Springing up.	No. of plants.	Buds Visible.	Buds died.	Blossoms.	Fallen Blossoms and Fruits.	Ripened fruit.	Percentage ripened.
April ...	7	1,700	1,231	469	163	306	18
May ...	10	2,586	1,819	767	199	568	18
June ...	2	154	196	48	12	36	23
July ...	1	60	24	36	19	17	11

Eighty five fruits give one pound of raw cotton.

The plucking of the cotton is the most annoying and the most expensive work in the cotton industry.

The harvest of 1894 amounting to 7,500,000 bales is said to have cost to pluck alone 150,000,000 guilders.

The average cost of plucking 50 *k.g.* of raw cotton is from *f* 1 to *f* 1.25. A plucker can gather about 333 lbs. a day but they usually gather only about 100 lbs. Bad plucking can cause a lot of harm

by dropping cotton or dirtying it with earth or smudging it with the sap from the fruit. Attempts have been made to replace hand labour by machine labour in plucking, but without satisfactory results.

After the cotton has been plucked, the remainder of the plant is used as fodder, which is equal in strength to wheat straw.

Animals are fond of the cotton plant in any stage of growth but not when the shrubs have died, or dried and become tasteless.

The tough stems which are not eaten by the animals are made into fibre. These are woven into a kind of sack-cloth which is very suitable for the making up, of the bales of cotton.

Diseases and Plagues.

The diseases which endanger the cotton plant are of three kinds;

a. Diseases, due to physiological causes, amongst these are the mosaic-disease or the yellow-leaf disease: the autumn leaf or red-leaf disease; the falling of fruits etc.

b. Diseases caused through fungi to which belongs amongst others the root-rot; cotton-leaf disease, mildew, fruit-rot; etc.

c. Nematode-disease; root-gall.

The greatest loss is caused the cotton planter by insects. The most dangerous of these being the cotton-caterpillar (*Aletia argillacea*. Hübn.) The caterpillar which eats the fruit (*Heliothis Armiger*. Hübn.) causes also a lot of damage yet not by far to such a degree as the first named.

The loss of the cotton-planters, due to the cotton-caterpillar amounted to yearly 37,500,000 guilders, and that not so very long ago. In some years this amount has even been surpassed.

This plague has now practically been mastered by having a more rational culture and suitable remedies.

In the first place the cotton planters do not exclusively plant their fields with cotton but plant besides cotton, grain and fodder plants on other parts of their land.

Since the cotton plant has proved to be valuable as fodder as well as for the oil industry it is not the custom now as it was once, to grow that kind of cotton which has few seed and long hairs.

Owing to the value of the seed the kind having a higher percentage of them is now usually planted although this gives less cotton yet the loss is amply made up for by the other profit.

The form and growth of these shorter varieties permit of a better combat with the caterpillars. The plantation is more open. The caterpillars become more conspicuous and cannot hide themselves in the bushy parts, as is the case in the other kind.

Besides a dusting with Paris green is used with good success. The manner of dusting is very simple, it is done with the help of two bags, hung on a stick held across a horse. In this way one man can easily manage 8.5 to 11.4 bouws per day. Next to the cotton caterpillar, the fruit-caterpillar (*Heliothis armiger*. Hübn.) is the most harmful.

The Treatment of the Cotton.

Formerly it was the custom to store the cotton after it had been plucked in sheds, specially built for that purpose. A still older system was the keeping of the cotton in the open field on the spot where it was reaped. The cotton was simply stacked in heaps on a waggon and covered with a tarpaulin.

With Sea-island cotton, which is, as has already been mentioned above, still dried on platforms in the old fashioned manner, and then stored as raw cotton, another method is now adopted, in preparing the cotton for the market.

The cotton, as collected goes directly to the flock-mills where it is cleaned and packed into bales by machinery.

With this modification of the old method, all sorts of faults came to light which had not been properly considered on the erection of the mills and many obstacles had to be cleared out of the way, before the chief cleaning factories attained their present state.

It has been noted that before the erection of these central flock-mills, the cleaning, sorting and packing by hand was done with more exactness than the machinery is able to do it.

On big plantations each plucking was treated by itself, by which different qualities were made.

As the large plantations disappeared and made room for smaller ones, these differences in quality could not be made any more as one plucking gave scarcely sufficient cotton to make one bale.

The central flock-mills have decreased the cleaning costs considerably but partly at the cost of the quality.

The cotton suffers nothing by being sent through the plain flock-mills, (gins) consisting of two hard rollers, turning in opposite directions, which free it from the seed. That which has not been done by the machine is done by hand.

The new gins driven by steam or water power do the work quicker, but they give more refuse and damaged fibres, with this also goes the fact that the fibres suffer in their elasticity.

There are two principal kinds of cleaning machines, the so-called "Rollergin" and the "Saw-gin".

By the spinning of the cotton into threads one reckons a loss of from 13–23 % made up from loss of moisture, impurities, spoiled fibres, etc. These figures should be lower.

After the cotton has been pressed into bales it is packed into sack-cloth (rough jute cloth) and bound by iron bands.

As to measurements and weights of the bales, the American Standard bale has these measurements: 1.35 by 0.67 ^{2}M. and its weight is about 500 lbs.

It is curious that the size and weight of the bales has increased with the increase of the cotton-produce.

The weight of the American bale has been attained from 300 lbs.

The American cotton is known for its slovenly and clumsy packing. A better and neater packing, for which special machines have been constructed, has not found general use.

One has to fight against old habits and uses.

The cost of the sack-cloth and iron bands weighing together from 10.5–12 k.g is about *f* 1.50 per bale, but in Liverpool where the price of the cotton is made, the tare is counted 6 %. Each bale thus loses 30 lbs., a figure which is higher than the actual tare.

Formerly the costs of cleaning the raw cotton according to the old system amounted to *f* 12.50 per bale, but at present these have considerably diminished, as for instance in Texas they are about *f* 7.50 per bale, the while in some parts of the East, these have even fallen to *f* 2.50.

The flock-mills, estimated at 23,000 chiefly owe their use to the importance which the cotton seeds have gained in the last years.

The farmers who supply the cotton, take back with them cotton seəd flour, which they use as fodder and manure.

It is intended to connect with the flock-mills, oil-factories and to refine there the oil which comes from the cotton-seeds, so that it may be used as frying oil.

This oil is used on a large scale in stead of Olive oil, in the preservation of sardines and in the preparation of margarine, etc.

These facts show that the flock-mills have considerably contributed towards the decrease of the production cost of cotton.

Besides the oil and the residue which can also serve as fodder, are also obtained.

Through the absence of flock-hairs on the seeds in the New Island cotton, which cause the husks to be difficult to remove in the extraction of the oil, the oil got from the seeds of this kind, is of lower quality than that from the shorthaired cotton varieties.

Literally speakirg no part of the cotton is wasted in America.

The cotton seeds contain about 20 % of oil, but the oil-factories get on an average not more than 15 %.

The cotton-oil industry yearly yields a produce of a value of 75,000,000 guilders.

As regards the sale of the cotton, formerly the planter himself, or his principal, shipped the cotton to the chief markets in Europe or America.

At present the greatest part of the harvest goes over into the hands of the manufacturers or merchants who have given the planter advances.

The planter can get an average advance of *f* 25 per bale, but that however against the highest possible interests that the Government allows.

For commission and storage is calculated on an average *f* 2.50 for the former and for the latter *f* 1.25 per bale for the first month and for each successive month the half of *f* 1.25.

Including the iusurance the sale costs the planter 1.25 cents. per lb. of clean cotton.

In America the cotton is quickly sold, as the agents of the spinneries or merchants live in the neighbourhood of the flock-mills, which buy the cleaned cotton from the planters at the market rates.

At present also a large amount of cotton goes through the hands of export firms, whose aim it is to bring the producer and the con-

sumer in direct connection with each other by which the costs of transaction have been not a little reduced.

These big companies are satisfied, with a net profit of 6% on the huge capitals with which they work.

The following figures will shew how the expenses have decreased in the last years. In New Orleans they fell from $31\frac{1}{4}$% of the harvest value to $12\frac{1}{2}$%; in Memphis from $9\frac{3}{4}$% to $4\frac{4}{5}$%; in Charleston from 7% to $2\frac{2}{5}$%.

In conclusion a few words on the costs of transportation.

This varies according to the kind of thing; the place, the route and the freight charges.

Yet, although freight has generally become cheaper, it presses on the cost of production and this is especially felt when the price of cotton is low.

The cotton manufacturers in the land where the cotton is grown, have here the advantage as they can procure the raw material cheaper than the foreign cotton spinneries.

Yet one feels inclined to think that the freights are of little importance to the manufacturer, as the woven articles must be exported back again but then one overlooks the fact of the difference between the freights of the raw material and of the things made out of it. Where the freight for the raw material if 75 cents. per 50 *k.g.*, this is in the case of the woven goods *f* 1.175.

From the following figures can be seen what a difference the freights on the total cost at different cotton prices can come up to.

The cost of shipping raw cotton to Liverpool from cotton growing countries on the Atlantic Coast amounts to *f* 12.86 per bale of 500 lbs.

Assuming for instance that one pound of cotton costs 12.5, 20, or 27.5 cents. then the costs with the tare as 6% included will be respectively *f* 16.61, *f* 18.86 and *f* 21.10 or expressed in percentages of the prices 24, 18, 15% respectively.

Let us once more consider all the expenses which have to be paid on the cotton from the time it leaves the farm till it comes to Liverpool into the hands of the cotton spinner.

The expenses of cultivation up to the flock-mills amount to 14.45 cents per lb on the average. Presuming that the costs of the cleaning are covered by the value of the cotton seed, then there remain the expenses from the flock-mills to Liverpool.

These amount to, at a cotton price averaging 20 cents. per lb., 3.77 Ct.

We then come to the conclusion that America can deliver the product at 18.22 cents per lb.

THE COTTON-CULTURE IN EGYPT.

From times immemorial, the cotton plant has been grown in the Upper Nile territories, especially so in Abyssinia. Seeds of this cotton variety were imported into Lower Egypt about the year 1820, and the export of Egyptian Cotton to Europe dates from that time. The export of cotton from Egypt does not annually increase in the

same way as in other lands. In 1895 it exported 634,000 bales at 400 lbs. each.

According to FOADEN, the present production is about 557,500,000 pounds of fibre, of which the greatest part is exported and 810,000,000 litres of cotton seed of which also the greatest part is exported.

Extensive irrigation and drainage systems are in use, which unquestionably increase the production.

Other agricultures are abandoned in order to work more exclusively on cotton.

The average product of the Government lands amounted to 44 lbs. per bouw, during the years 1879–1894, representing a value of *f* 186.50. During the 3 years, 1892, 1893 and 1894, the value of the Brutto product per bouw amounted *f* 227—, the while, according to FOADEN the value of the product of the present day is estimated at *f* 288.80. The cotton seed brings in *f* 19.70 per bouw, while the woody part of the cotton shrub is used as fuel which represents another sum of *f* 10.90 per bouw. The total cost of production is estimated at *f* 201.20 per bouw, while the fibres, seeds etc., realise *f* 288.80 per bouw giving the farmer a profit of *f* 87.60 per bouw.

More attention is paid to the packing in Egypt than in America.

There is still, even if not much, some Egyptian cotton, exported to America.

In the expenses, rent and irrigation stand foremost. Alone for rent and taxes one pays in Egypt *f* 118— per bouw, while irrigation costs *f* 30.60 per bouw. The remaining expenses are small as may be seen from the table below.

Rent, inclusive of taxes	*f*	118.—
Irrigation	,,	30.60
Preparation of the land, sowing, manuring etc.	,,	24.10
Seeds	,,	2.20
Upkeep, shovelling, thinning etc	,,	8.70
Plucking wages	,,	17.50
Total, ..	*f*	201.10

As an average produce, FOADEN gives 600 lbs. per bouw, but good soils yield well over 1,225 lbs. per bouw.

The cost of production then amounts to, after deducting the seeds and fuel, *f* 28.3 per lb. an amount considerably higher than that for American cotton. But this is largely compensated for by the higher prices that are paid for Egyptian cotton.

From the above account of expenses it can be seen, why in Egypt the cotton is not only grown extensively, but as the chief plant.

If we turn to British India, after America, one of the chief cotton growing lands, then we see in the comparison with America and Egypt that there the cotton industry is going rather backwards than forwards. It gives the planters little advantage to extend their places, which is the reason why they leave this culture.

The soil of the cotton growing country there, is very suitable in general for this purpose, but the vicissitudes of the climate causes a considerable risk to be attached to the industry. Another reason, which stands in the way of the extension of the cotton, industry, is the poverty and the indifference of the natives, so that there can be no question of an extensive culture; which in regard to the changeability of the weather might be somewhat improved. How little the culture is worked there shew the figures which are given as the average produce, these are 70-175 lbs. of cleaned cotton per bouw.

It is very difficult to make a first statement of the production costs for British India, therefore the following are only given as approximate.

Ploughing and working of ground -	*f* 4 55
Seeds and Sowing - - - -	„ 1.40
Upkeep - - - - - -	„ 4.20
Reaping - - - - - -	„ 5.60
Cleaning - - - - - -	„ 2.62[5]
Manuring - - - - - -	„ 4.20
Rent - - - - - - -	„ 9.10
Total per bouw,	*f* 31.67[5]

If the average product of clean cotton is put at 150 lbs per bouw then the cost of production amounts to + 21 cents per pound.

During the big cotton scarcity of the years 1861 and 1865, which caused the English spinning industry immense loss, the English did their utmost to spread the cotton culture in India in order to make the mother-country less dependent on America.

This was successful to a certain extent; but not long had the War in America been ended, when America actually took her old position again, and her cotton production increased, while that of India remained stationary or decreased. The spinning industry, was however imported with more success.

The first spinnery was erected at Bombay in 1854. Five and twenty years after there were 56, with 1,500,000 spools, and in 1889 this number went up to 124 with 2,763.000 spools.

After these, somewhat lengthy statements, regarding the cotton culture elsewhere, which may be considered as necessary for the proper judging of the possibilities of the existence of this culture in our archipelago we shall follow what has been done here towards this industry by Government as well as by private individuals.

In the days of the East India Company endeavours were made to extend and better the cotton crops in the Netherlands Indies. Yet these proved only of little profit. In 1833 a bale of Javanese cotton, coming from the residency Kediri, was sent by the Netherlands Trading Society, to Holland, but there it was found to be inferior in fineness and length of fibre to the American sorts, so that the importation was discontinued.

At about the same time however, after the abolition of the East India Company, experiments were made for the first time with sam-

ples of the crops of a better kind of cotton. They seem to have been chiefly grown in Bandjermassin, where good results were expected in the beginning, but which were, however, not realised.

In Java also trials were made, chiefly with *Gossypium vitifolium.* It was found that the seeds came up, but that a certain caterpillar belonging to the "Leaf-rollers" nestled itself in the fruit and destroyed the largest portion of the crop. This induced Government, in 1839, to cease further trials.

The thing was, however, again taken up, when 3 or 4 years later, a certain Mr. VAN TOLL, who had managed a cotton plantation in Surinam, came to Java in order to start an undertaking in Cheribon. It was expected that his wide experience would bring about better results, and that induced Government to make a contract with this gentleman for conducting new trials, for which, seeds from Surinam, South Carolina and later from New Orleans were sent to him. One bale sent to Holland in 1845, as a result of these trials, seems to have been of a very satisfactory quality; but Mr. VAN TOLL found the crop out of all proportions to the cost and trouble connected therewith, so that in 1847 he asked for and obtained the revocation of the agreement.*

At about the same time Government took up again, at the request of the mother countries and individual persons, trials with foreign varieties of cotton in the envirous, and chose therefore Palembang, the land of the cotton, where the production of the cotton is estimated at 30,000 pikuls annually. If the new kinds could be grown anywhere, then it would be certain in this case as the inhabitants were acquainted with cotton-growing. The native cotton was somewhat short and badly gathered and prepared. It was hoped to bring about a change in this by the importation of new and better kinds of cotton.

The Netherlands Trading Society being of opinion, that by the

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* Mr. L. J. VAN TOLL came to Java in 1840, with a recommendation from the Minister of Colonies, as specially experienced in the culture and preparation of cotton in the West Indian manner.

Mr. VAN TOLL made an investigation-tour over Java, at Government costs, which resulted in his becoming acquainted with the kinds of soil and the climate, as well as, with the disappointments, which were met with in the growing of foreign kinds of cotton, wherefore he hesitated to start an undertaking on his own account and risk. He therefore wished preferably to open a sugar plantation. He was however very willing, on a salary and travelling allowances, provided he was allowed a sugar conract, to make small trials in the parts of Java, which were most suitable for cotton culture. A contract was made with Mr. VAN TOLL for the cultivating of sugar and cotton in Kadipatten in the residency Cheribon, and that, with an advance of ƒ80,000 without interests. Not much came of this affair, for on the 14th March, 1843, the Government declared the agreement null and void.

The sugar industry was given over to Baron LEYSSIUS, and the cultivation of cotton was contracted for with Mr. VAN TOLL.

The contract for cotton was nullified in the year 1847, on the request of the contractor after he had spent from 4 to 5 thousand guilders on the affair, without having had the slightest advantage.

The Director of Cultivation remarks on that, "that the appearance of this expert in Java has not brought the cultivation of cotton for the foreign markets, one step forward but has only served to verify that which undertakings of former years have already clearly shewn namely that the nature of the soil and the climate of this island are not suitable for the cultivation of foreign cotton on a large scale."

The Director of Cultivation wrote to the Government in 1856 to that effect.

cultivation of better kinds of cotton and the erection of cleaning factories at Palembang the cotton industry would quickly go ahead, put itself at head of affairs. It requested from Government permission to take charge of the management of the trials, and the buying of the produce and further asked for a concession to put up a factory for the cleaning and pressing of the cotton.

The Government gave this Society its greatest possible support, in order to further the success of the thing. At Palembang the Government itself assisted in the erection of the factory, and in the meantime, it had distributed among the inhabitants of the different districts, seeds from New Orleans, for planting. This was on the advice of the Trading Society. The Resident personally saw to the matter, as he knew that the Minister of Colonies, was strongly interested in the cotton industry.

The Resident had again to report, that the seeds had nowhere come up, and he thought that the fault lay with the seeds. The seeds were dead. In his notes the Resident says, that the cotton is the favourite plant of the natives of Palembang but that the changeability of the weather is disadvantageous to this cultivation. The cultivation is mostly done on grounds which serve for rice growing.

Previous to this, under the direction of Resident Pretorius, trials were made with the planting of foreign varieties of cotton. The New Orleans seeds then imported sprang up well, but the inhabitants wanted to have nothing more to do with the matter after the experiences they had had with the new kinds of cotton.

In 1847 the Director of Agricultures wrote to the Government, that the various trials of planting foreign varieties of cotton in Java had entirely failed.

It is only lately that the last cotton undertaking, that of Mr. VAN TOLL in Cheribon has been given up, and it may be taken on the grounds of these experiments that Java is not suited for this industry.

In the Palembang Residency, also the ground and conditions seem to be less suitable for the kinds of cotton, wanted in the European markets, than for the native kinds. It only remains for the inhabitants there to choose the latter kind. I see little or no advantage in inducing them to grow foreign cotton.

It would be of more advantage to the inhabitants of Palembang to show them, before all, a way of better preparing and cleaning their own products.

The Governor-General wrote to the Minister for Colonies in 1848 the following:—

"Truly all experiments of this kind in Java have proved unsuccessful and they have shewn, that disregarding the injurious influence which the moist air and the changeability of the weather have on the cotton fruit, a certain worm which burrows into the fruit and spoils it before they have reached full maturity, proves to be an obstacle, scarcely removable, against the growing, in Java, cotton suitable for the European markets, in sufficient quantities to repay the cost and leave a profit."

This last was added as a precaution as the economical side of the question was its weak point.

In 1850 experiments were again made with another kind, namely Dacca-cotton, received from Bengal through the Trading Society.

At the special request of the Government, to take good care and neglect nothing in the interest of the trials, the seeds of this kind of cotton were sent to

1. The Lampong Districts.
2. Palembang.
3. Makassar, to be specially planted in Toratea and other known cotton places.
4. Bandjermassin.
5. The residency Bezooki, where according to Dr. ZOLLINGER, excellent lands for the cotton culture, are said to be on the slopes of the volcanic mountains in the districts Panaroekan and Bondowosso.
6. Buitenzorg and Tjipanas.

The reports received on the experiments with Dacca cotton are nufavourable with regard to Buitenzorg, favourable for Bezoeki, and less favourable for the residencies South and East districts of Borneo.

The Director of Agriculture, at that time, brought out a report regarding the trials to the following respect "that the trials with cotton crops in Java by no means answered the expectations. The chief cause of this failure must be attributed to the insects, by which the fruit of this cotton plant (Dacca-cotton) were spoilt". On the proposal of the Director of Agriculture the Government had the trials with Dacca-cotton continued in

a. The Residency Bantam (on the West coast along the Straits of Sunda).
b. The Residency Bantam (on the North Coast).
c. The Residency Banjoemas, on the South coast in the vicinity of Tjilatjap, on the Kinder-sea in the division Patjitan, on the lower parts of its coasts.
d. The Residency Soerabaja, on the low lands formed by the drainage of the Solo and Kediri rivers.
e. The Residency Bezoeki.

The Government ordered the Director of Agriculture to write to the concerned authorities concerned in this matter of the trials with Dacca-cotton to pay due regard to the places where the conditions of soil were somewhat similar that of the district Dacca in Bengal, which lies in the Basin of two great rivers (Ganges and Megna) and is crossed by the Bramapootra which rivers form a delta at their mouths, which is flooded alternately by the sea and the rivers, by which the saltish muddy soils are formed, on which the fine Dacca-cotton is grown.

In the Residency Bagelen, on the intervention of the Trading Society trials were again made with Pernambuco and New Orleans seeds, which went fairly well in the beginning, but later again proved a disappointment as the cultivation at a cost of *f*22 per pickul would not pay.

The Government did not confine itself to one or the most a couple of varieties only, but, not to speak of other kinds, trials were made with Sea-island, New Orleans, Pernambuco and Dacca-cotton, and even seeds of the crops from Siam and Cochin China were brought over here, yet always without any good results.

The Director of Agriculture in 1857, was urgently requested by the Government to report what had been done in the interests of the cotton-culture and answered that the foreign culture under the Direction of the Commissary General Du Bus de Gisignies was not only undertaken in Java but also in the Environs; he was so much concerned for the Government that a special commission of Agriculture, which had sub-commissions in all parts of Java, was kept busy with a minute investigation of the results.

The results were unsatisfactory.

Nevertheless trials were continued under the direction of Commissary General J. VAN DEN BOSCH and the Governors-General Band and de Eerens yet without success.

The chief obstacles against the importation and spreading of this culture were.

a. the nature of the soil and

b. the climate, both of which do not seem to be suitable for the cultivation of foreign varieties of cotton on a large scale.

The Director of Agriculture reported also on what had become of the trials of New Orleans cotton seeds, ordered in 1856 and made in the residencies Soerabaya, Pekalongan, Cheribon, Bagelen and Banjoemas.

The Resident of Soerabaia reported that nothing came up from the seeds sent to the different departments, and put the cause to the old age of the seeds used.

The director doubted this last argument, as seeds of the same lot, were planted by him in his own garden, all of which came up well. Scarcely had the fruit however, reached ripeness, than, as it seems the natural enemy of these plants of all the foreign cotton kinds, shewed itself in the shape of a small worm which gnawed through the seed but spared the fibre.

After this result the Director of Agriculture sent another small bag of New Orleans cotton seeds to the Residency, Soerabaia.

The Resident of Pekalongan mentioned in his report that the good seeds had come up nearly everywhere but owing to the heavy rainfalls, the blossoms fell off, and the harvest was small.

A report from the Residency, Cheribon, that in the department Ploembon, 10 katties of cleaned cotton could be reaped in 100 days from 5 square roods of ground. From a similar area, however, in Koeningan only 4 katties of uncleaned cotton were obtained. The Resident reported that there also the insects had made their appearance.

In Bagelen in the department Poerworedjo and Ambal, the experiments proved fairly good.

In the departments Ledok and Keboemen the trials however, failed. Most of the plants had blossoms but no fruit.

In Banjoemas the seeds were planted by the European officials

on their estates and came up, they obtained there a small quantity of cotton.

The seeds distributed among the native Chiefs yielded no product whatever. The Resident blamed either the continued rainfalls in 1856, owing to which the blossoms fell before the fruit had set or careless treatment.

From the Resident of the West Coast of Borneo came a report that the seeds had not come up.

The Resident of Palembang reported that the experiments with the New Orleans cotton had totally failed, not owing to the inferior quality of the seeds but through the unfavourable changes of the weather.

The demand by the inhabitants for seeds of the native kinds of cotton is there, however, great and sometimes 20 pickuls Ogan-kapas seeds are bought at the expense of the land and distributed among the people.

Also in the Preanger regencies trials with New Orleans cotton had been made as well as in the environs of Tjiandjoer; but with negative results.

On account of the notification of Government to the encouragement of the cotton culture, the Resident of the Preanger-Regencies reported that in the Southern part of the regency Tjiandjoer chiefly in the Djampangs two kinds of cotton are grown, firstly the there native cotton, namely the Kapas Temen or K. Nja, and secondly the Kapas Palembang, a cotton variety which comes, as the name indicates, from Palembang.

The so-called Kapas Moeri is occasionally grown here and there on the estates but does not appear in the market.

It was with some difficulty that, to satisfy a request of the Government for some 50 k.g. of cleaned native cotton, to be sent to a Dutch cotton factory for testing and valuation, that the required amount was obtained.

From this it can be seen that the native cotton planter cannot deliver the cotton at the price which the Dutch manufacturer is accustomed to pay in Europe for that kind.

In his notes the Resident said—"that the native can prepare from 2 piculs uncleaned cotton at most $\frac{1}{2}$ picul or 62.2 lbs. of cleaned cotton.

"The uncleaned cotton was sold in the Djampangs, on the spot, even at the time the best prices for 10 duits a kattie or 8 duits a pound, but now the lb. always costs 13½ duits. To prepare one pound of cleaned cotton at least 4 lbs. of uncleaned cotton are required, so that the original stuff for 1 lb. of cotton saleable in Europe, at the place even at the time of the best prices costs 32–34 duits, without taking into consideration any expense for cleaning. As now according to Trade Reports of Amsterdam one pound of cotton of the kind described is worth in Holland not more than 34 cents it follows out of this that the cotton is here, at the place of production, even dearer than in Holland and that under the present conditions it cannot become an export article for the trade."

In 1858 the Director of Agriculture reported to Government that

the experiments made in the Residencies Bantam, Krawang, Rombang, Bezoeki, Banjoewangi, Madioen, Bagelden and Kediri, with the four kinds of foreign cotton had entirely failed. This failure is generally said to be due to the bad quality of the seeds, the late time of planting, the unsuitability of the soils used and the unfavourable weather.

As may be seen there has been here no lack of causes. In the departments Poerworedjo and Koetoardjo the results obtained were more favourable. In the first, the Egyptian, Sea-island, Pernambuco and British India cottons had been planted, yet the experiments must have been made on a very limited scale, as it is stated that from the first 27; from the second 21; from the third 11; and from the fourth kind 50 plants had sprung up. The tests made with the varieties off foreign cotton on the West cost of Sumatra in Minahassa and in Gorontalo may also be looked upon as failures.

The Resident of the Southern and Eastern divisions of Borneo reported in 1858 that the last trials of planting cotton in his territory were crowned with the best of results.

The Director of Agriculture intimated that from his side he would leave nothing untried for the furtherance of cotton agriculture and suggested to the Government eventually, to get the Government Botanist Mr. TEYSMANN to make investigations regarding the cotton industry in the residency of Palembang and the Lampong districts. This was resorted to. Mr. TEYSMANN having returned from his journey, reported on it.

In his report, TEYSMANN agrees with the resident, that in several parts of the Lampong districts cotton growing could be done on a large scale with good results. The Resident, however, took into consideration that the climate might be an impediment as there "was no regular change of monsoon, as in other parts of the Archipelago, which might cause bad crops". Furthermore the Resident was of opinion, that without the proper European supervision of the cotton culture the results wished for would not be attainable.

At about the same time Professor de VRIESE of Holland was sent out in order to investigate the agriculture of the Netherlands Indies.

Both TEYSMANN and de VRIESE, after what they had seen and observed of the cotton culture, held quite optimistic views, regarding the importance which that culture might in time, attain in our colonies. They urged the Government on to continue the experiments with energy and to do everything possible, which might bring about the settling of this culture in this country. In the first place de VRIESE ordered a spreading of a better knowledge concerning the growth of cotton, which resulted in TEYSMANN being requested to compile a manual for cotton growing in Netherlands India and which was duly effected by TEYSMANN.

TEYSMANN having meanwhile been made Honorary Inspector of Agricultures gave special care and consideration to the cotton industry.

The order to investigate, with cotton cultivation growing, the

action of the residency Palembang and the Lampong Districts, was followed by a similar one in the Preanger Regencies, Cheribon and Banjoemas and in 1859 it was extended over all Java, Madoera and Bawean. Besides that, Teysmann put himself at the head of the cotton industry in our archipelago and from his own investigations, he in 1859 brought out a written report, addressed to the Resident.

What has been done, with respect to the native as well as foreign kinds of cotton and with what results the undertakings have been crowned may be seen from the several reports from the Residents. With these reports, and after considering the cotton culture in America and Egypt it is possible for us to throw a critical glance on the chances of success, in lands, such as our own is.

The following are the chief points extracted from these reports.

Preanger Regencies.

The cotton is here grown, as a secondary plant together with the paddy gaga or tipar, but not as such on the sawahs, and that especially on the low lands on the South Coast of the regencies Tjiandjoer and Soekapoera.

The kind that is grown is one of the most fruitful, of the whole of Java, and is known under the name of Kapas Koemas, one of the many varieties of *Gossypium indicum*, found in Java.

It is planted at all times of the year, yet seldom at the most suitable time *i.e.* April and May. It is planted at 1½-2 feet by 3-4 feet; but as the paddy is sown at the same time, the sowing is done very irregularly, and the paddy seeds are mixed up with those of the cotton.

As the sowing is generally done at the unfavourable time of the year, that is in the rainy season, the continued rains become the cause of failures.

The average harvest is 4 piculs per bouw, and a very satisfactory crop brings in about 10 piculs per bouw.

The price is very variable, it is with the planters 8-10 duits and on the bazaars 16-20 duits per kattie with the seed, or *f* 0.38-*f* 0.48 per lb. of cleaned cotton.

Teysmann is of opinion, that the cotton culture over the whole residency could be considerably extended, if the Government would push the matter on, by which too the price would considerably decline, so that the prices would come more in relation to the actual price which is considered by Teysmann to be *f* 5 per picul (*) yet according to Teysmann this should give good results; the cotton having then to be grown as a secondary product, after the paddy harvest, on the sawahs, for which before all, the New Orleans variety must be noted, which is found in small quantities, here and there, but does not yield the expected results, owing to the improper time of sowing.

According to Teysmann, there are thousands of bouws of sawahs or wet rice-fields on which no secondary plants are grown.

* A valuation of Teysmann's which can be said to be exaggeratedly low. That the market value of 16-20 guilders should fall to *f* 5 may be doubted.

CHERIBON.

In this residency there is still a lot of Java cotton planted. Teysmann estimates that from the 182,000 bouws of sawahs, that this residency has, 75.000 could be planted with cotton as a secondary plant.

On some places, however, cotton is planted between the paddy gaga, while on the estates of the natives, here and there is to be found some Pernambuco cotton (*Gossypium vitifolium*).

In 1858 there were about 5,000 bouws of sawahs planted with cotton as a secondary plant, chiefly in the departments Cheribon, Madjalengtha and Koeningan

The harvest is estimated by Tesymann at 10-16 piculs per bouw. The planter receives on the average from *f*8-*f*15 per picul. The bazaar price may be put at *f*20-*f*30 per picul with the seeds.

A pound of cleaned cotton then comes to about *f*0 48-*f*0.72. The chief kinds that are grown are Kappas Moeri, Kappas betoel and Kappas tembaga, all of which are varieties of Gossypium indicum.

In 1858 there were about 6,000 piculs of cotton exported while 10,000 pirkuls were imported.

The export was chiefly to Tegal and Pekaloengan, while the import was from Palembang and Samarang.

The Palembang cotton still realised in 1859 *f*16 per picul with the seeds, being equivalent to *f*0.38 per pound of cleaned cotton.

Experiments made in these residencies with foreign kinds, such as New Orleans, Sea-island, and Pernambuco, proved unsuccessful.

TEGAL.

There is grown, scarcely any cotton at all, in this residency.

Experiments with foreign kinds proved equally unsuccessful.

The inhabitants declare the heavy clay soils to be unsuitable for cotton growing, but Teysmann does not share this view, as the cotton is grown with success in Dĕmak, where the soil is even stiffer.

PEKALOENGAN.

In this residency as well, little is done in the way of cotton growing. The inhabitants seem to obtain more profit with other secondary plants.

Experiments with foreign kinds of cotton yielded unsatisfactory results.

SEMARANG.

In the year 1858 there were 7,900 bouws of sawahs planted with cotton, which yielded a produce of 60,000 piculs of which 1,000 piculs were New Orleans cotton.

The New Orleans cotton is the most valuable but owing to the irregularity of the plant and the greater tendency to be destroyed by insects it is not esteemed by the Javanese.

In 1858 the price paid for Kappas panjang (New Orleans cotton) was *f*15-*f*25 per picul or *f*0.36-*f*0.60 per pound cleaned cotton, while the Java cotton fetched not more than 8-12 guilders per picul or *f*0.192-*f*0.288 per pound of cleaned cotton.

Teysmann cherished the hope that the cotton culture would be considerably more developed in this residency, for which besides the example of Dĕmak there was also the possibility of increasing the cultivation by thousands of bouws.

In Dĕmak itself, where according to statements, the largest amount of cotton is grown in our archipelago, it could easily be doubted.

The New Orleans cotton has for many years been grown in Dĕmak; it grows there very satisfactorily, and gives the planter good profits, as the yield there is 12 piculs per bouw.

Of the 9,800 bouws planted with cotton, only 187 are planted with New Orleans cotton. TEYSMANN, however, found as a fact that the cultivation of this variety increased but slowly, yet it has nowhere in Java attained such an extent as in Demak. This culture has here been furthered entirely by its own quality, yet it will not attain the extension of Java, that is wished for unless assistance steps in and pushes the cultivation on with energy. It has no advantage over Java cotton, as in order to grow well it requires a rich soil, which is indeed found in most sawahs, but which has to undergo a proper preparation, while this is of little importance with the Java cotton. In the cultivation of the latter kind, only the surface of the sawahs is loosened, against the growing of the weeds, and to fill in the cracks which are made by the dry season on the sawahs.

The New Orleans cotton is less able to withstand long continued rains than the Java cotton. It grows best when sown in April or May.

The New Orleans cotton realised in 1858 in the harvest time 15 cents and later in the year 30 cts. while for the Java cotton only 6-12 cents per kattie of raw cotton were obtained.

JAPARA.

In this residency the cotton cultivation steadily declined as prices fell, whereby the risk, which is connected with the growing of cotton, owing to the changeableness of the weather and the insect plagues, is not covered sufficiently.

The Javanese cannot plant the cotton for less than 5–6 guilders the pickul and even then find difficulties with the cheating by Chinese.

The Javanese is more and more inclined to take to other secondary plants, such as tobacco, which gives him more profitable results.

The trials with foreign varieties of cotton, such as New Orleans, Sea-island and Egyptian cotton have proved, with a few exceptions, on the whole unsuccessful.

SOERABAIA.

In the year 1858 there were about 800 bouws planted with cotton of which most was on sandy soils.

The best plantations are found in Kapasan where the sandy soil requires little working. The plantations, always consisting of Java cotton, cover an area of × 300 bouws with an average product of

4 pickuls per bouw. The preparing and up-keep of the plantations is nearly all done with draught animals.

The prices lie between *f*8 and *f*12 per picul (=*f*0.192–*f*0.288 per pound of cleaned cotton.)

Experiments with foreign kinds have always failed. The heavy and in the dry seasons, strongly cracking clay soils, are not considered suitable for the cotton cultivation, to which TEYSMANN, however, does not assent.

MADOERA.

On this island also, some Java cotton and some of New Orleans is grown. Through the low prices of European linen this cultivation has declined.

PASOEROEAN.

The cotton cultivation has made little advance in this residency.

Rice, coffee and sugar industries require in this residency so much labour that there is little left for the cotton industry.

Furthermore, the usual secondary plants yield more profitable harvests.

PROBOLINGGO.

In this residency there exist practically the same agricultural conditions as in the last mentioned one yet in cotton cultivation something more is done.

In 1858 there were about 1,900 bouws planted with cotton. On the sawahs no cotton is planted. The harvest is very small, being only about 1 picul per bouw.

Cotton cultivation is not liked by the inhabitants, as katchang, kedele and djagong, as secondary plants yield them without doubt, more profit. The cotton only realises about *f*4 per picul, (*f*0.096 per lb. of cleaned cotton.)*

The experiments with foreign cotton yielded unsatisfactory results.

BEZOEKI.

The greatest amount of cotton is grown in the Department Panaroekan and that chiefly in Tegal fields, yet not more than from 200–250 bouws.

The cotton obtained is exported to Soemenep. The product is sold for not less than *f*12.50 per picul (*f*0.30 per pound of cleaned cotton.

The native however prefers djagong (maize) to the cotton cultivation.

The controller of Bezoeki is of opinion, that by the increase of the cotton cultivation, the production cannot be increased to such an extent, that the market would be over stocked and the fall in price so much that for the Java cotton it would be impossible to get *f*5 per picul.

In Biling experiments were made, through the controller, with the 3 kinds of cotton sent by the honorary inspector of agricultures,

* The cotton must have been, altogether, of a very inferior quality.

i.e. Petit gulf, Georges-oort and Sea-island, whereby the instructions of Mr. TEYSMANN were strictly followed, Of the 2,14c; 5,280; and 2,310 seeds sown, only 70; 180; and 2 plants came up respectively; of all the seeds sown of Orleans, Sea-island, Egyptian and other foreign kinds, wherewith experiments were made in the Department Banjoewangi, the shrubs yielded no produce. Also in the department Bondowosso similar experiments were made but with negative results.

KEDIRI.

In his answer to the enquiry of the honorary Inspector of Agricultures regarding the cotton cultivation, the Controller of Bletir states that the reason why no cotton cultivation existed in his Department, is, that more profit is obtained from other plants. It would not be possible to buy a picul of cotton for *f* 5.

With the cultivation of the new kinds, such as New Orleans, Sea-Island and Egyptian cotton, experiments were made in the Department. The plants grew well but bore few fruit.

In Kediri also, trials with foreign cotton kinds were made but without any important results.

The other Departments reported similar failures. The opinion here is, that however much the cultivation is extended, it will be impossible for the native to supply even native cotton at *f* 5 per pickul in the uncleaned state.

In the Departments Kediri and Kertosono, where most of the cotton is planted, the cultivation declined strongly. In 1859 scarely half of the area was planted with cotton, which before was about 1,000 bouws.

Other cultures such as tobacco yield more profit.

MADIOEN,

The Controller of Madioen reported that still 1,206 bouws tegal ground were planted with cotton in 1858 in his Department, but in the following year only about 50 bouws. In his answer he says, that the reason why this cultivation decreased, in spite of the continued urging, must, according to the verdict of the Regent and the District Authorities, be looked in the following circumstances:—

Firstly that the former planters of cotton now prefer to plant sugar and tobacco.

Secondly that the profits got by preparing and selling cotton, are now less than before as the natives use this material less and less for clothing.

Thirdly that the ploughing and working of the soil, having to be done with the utmost care gives much trouble and yields insufficiently.

Much extension is not likely possible as the native looks upon the many difficulties connected with the industry, and let it even be at a higher price than *f* 5 per picul, the cultivation will not be extended much more by the free will of the people.

According to the report sent in by the Assistant Resident of Ponorogo there were in 1859 still in his Department annually 1,400

bouws of sawahs and tegal fields planted with cotton. The harvest was more or less 3 piculs clean or + about 9 piculs unclean cotton per bouw. The clean cotton is grown at ƒ15-per picul, so that at a price of ƒ5-per pickul uncleaned cotton, it would be possible to extend the cultivation if the Assistant Resident urged it on.

Satisfactory results with foreign kinds of cotton had not yet been obtained.

Soerakarta.

The cotton cultivation is here practically of no importance at all.

Seeds of foreign kinds of cotton have been distributed to several land owners.

Djocdjakarta.

Owing to the extension which the indigo industry has obtained here and in consequence of the many vegetable farms for the numerous inhabitants, only a little Java cotton is grown in some places, and the growing of better foreign kinds has not yet become popular.

The Resident at the time, took much trouble, in setting some example in order to induce the Europeans as well as the native planters, to go in for the cotton industry.

Mr. Teysmann saw in the Resident's garden some well grown plants of Sea-island cotton.

Kedoe.

In this Residency there is scarcely any cotton grown at all as the cultivation of vegetables, yields undoubtedly more profit.

It is not possible to grow cotton for less than ƒ12.50 per picul = ƒ0.30 per pound of cleaned cotton. That is the price paid for cotton in the residency Kedoe.

Experiments were made with foreign kinds, which gave partly satisfactory and partly unsatisfactory results, which is attributed to the amount of rain.

Bagelen.

In this Residency there are many test-gardens, those in Koetoardje yield good results. The New Orleans cotton flourishes here as well as in Demak. According to Mr. Teysmann this Residency is suitable for the cotton industry. In the Department Keboeman 1,000–1,500 bouws are planted with Indian cotton. The harvest gives 3–6 piculs per bouw. The price varies from ƒ3–ƒ6 for the uncleaned, while for the clean cotton it is from ƒ6–ƒ12 per picul.*

The experiments with the foreign cotton failed for the most part.

In the Department Poerworedje some cotton is also grown, but the inhabitants prefer to grow other plants, as the cotton industry is so uncertain.

From ƒ17–ƒ24 the picul (= ƒ0.408–ƒ0.576 per lb. of clean cotton) are here paid for the cotton.

Of the foreign kinds which were experimented with in the Department Poerworedjo only the New Orleans variety came up.

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* Generally 3 piculs of uncleaned cotton give 1 picul cleaned cotton.

Banjoemas.

The answers that were sent in concerning this Residency are very unsatisfactory.

These results are attributed to the rains, which even fall, off and on, in the East monsoon.

The inhabitants shew little interest in this industry.

Klawang.

There is practically no cotton grown in this Residency.

Experiments with foreign cotton varieties failed.

Reviewing the results which were obtained with the cotton industry in Java, Teysmann comes to the conclusion, that in all Residencies of Java and Madoera, the cultivation of cotton can be extended more or less with advantage. In the Western Residencies, Bantam, Preanger regencies Banjoemas, Krawang and Cheribon this industry is, owing to the irregularities of the climate and the great quantities of rain in the East monsoon, subject to more failure than in the Northern and Eastern Residencies. Because of the many bouws of sawah fields, the greater extension should be possible in the Residencies Tegal, Pekalongan, Semarang, Djepara, Rembang, Soerabaia, Kediri, Madioen, the Forest-lands and Bagelen. In the Eastern Residencies Pasoeroean, Probolingo, Bezoeki, Banjoewangi and Kedoe, although the climate and soils are specially suited for the cotton industry, there can be no extension as the already extensive sugar and coffee industries take up the most suitable ground, further more the long droughts there compel the natives to grow fodder and lastly the other industries have already taken up most of the land.

Teysmann also considers that the cotton, in an uncleaned state can be supplied at *f* 5 the picul (= *f* 0.12 per lb. clean cotton) with an average crop of 5 piculs (=625 lbs. raw cotton or 208 lbs. clean cotton) per bouw. The Government ought to warrant the native this price. His views are based on the results of the Department Demak in Semarang.

The expectations which Teysmann cherished, about the cotton industry, especially of the better foreign kinds, were not in reality realised.

The Colonial accounts of 1859 give proofs thereof. In the report of 1859, when still 40,000 bouws were planted with cotton, Government notified that large quantities of seeds of the different varieties had been ordered from America, to be distributed among the inhabitants of the different Residencies of Java and the environs. In the very first year the experiments failed to a great extent which was attributed to the less favourable conditions and damage by insects.

Experiments were not only made with imported seeds, but also with seeds obtained in the Department Demak and Grobogan in the Residency Semarang, which has yet the best name as a cotton country, and from which the best results were expected. In these Departments too, large quantities of seeds were bought by Government for distribution in other Residencies.

Similar results were obtained with these experiments, as the following year the report had to state, that the experiments made by Government had as yet proved little successful.

The experiments with New Orleans Sea-island and Egyptian cotton seeds, as well as with those of the native cotton from Demak, yielded on the whole again unsatisfactory results, which was chiefly due to the weather.

The Director of Agricultures says in his report, that the inhabitants are averse to the cotton industry because of its great uncertainty, and the prices of the native as well as foreign cotton kinds are not equal to the profits, which they can make with other secondary plants.

Not only did the Government, make experiments, in order to induce the native to extend the cotton cultivation, but some private individuals tried them also.

In 1861 the anonymous firm "The Netherlands India Cotton Society" was founded with a capital of *f*300,000. The intention of the society was to further and better the cotton industry in the Netherlands Indies and the settling of cotton markets in Holland.

To this end, the named society, erected a cleaning and packing establishment at Soerabaia. In Demak and Grobogan and the other parts, where the cotton cultivation had still some importance, arrangements were made in order to ensure for itself the required quantities of the first subsequent harvest. It also made many agreements with farmers and planters outside of Java.

The colonial report of 1864 had to state that the results of the Netherlands Indies Cotton Society were very small.

To characterise what has been done since years by Government to make the cotton cultivation a national industry the editor of the colonial report of the year 1870 says the following;

"A proof of the small expectations concerning the hoped for results as reported from the residency Tegal is that the failure of not less than 290 bouws of a plantation of 882 bouws, is looked upon by the inhabitants as a very favourable result."

On the environs the results are not much better. In the colonial report of 1886 it was stated also "In the interior of Palembang the cotton cultivation, as a secondary plant, on the ladangs is a favoured industry. The market-rates have however been too low in the last two years to induce an extension. In 1885, there came on the top of it many failures of the crops by untimely rains or lengthy droughts. The total export, chiefly to Java, Singapore and China, however still amounted to 25,738 piculs against 40,524 piculs in 1884." According to the colonial report of 1888 there were in 1887, from Palembang still about 13,322 piculs exported. From the fact that in 1898, 68,000 piculs were exported from Palembang against about 15,000 and 14,000 piculs in 1826 and 1897 respectively, it can be seen how uncertain the cotton cultivation is in that residency.

About the Southern and Eastern departments of Borneo is reported that the cotton is grown in the department Amoentair and

that as a secondary plant. In 1885 an average harvest was obtained Experiments with Palembang seeds failed.

In the residency Semarang experiments were once more made with American cotton varieties, in 1888, but again without success.

The cotton industry is only again specially mentioned in the colonial reports of 1900, but after that this ceases, and it is only mentioned under the heading of secondary or other plants, besides rice. It had to be reported every year that the cotton industry was going backwards, instead of as before, in spite of the fact that the officers concerned tried their utmost to push it forward.

The great risk that the impecunious native runs in the growing of the better kinds of cotton, and even with the less sensitive Indian kind, makes it difficult for the Javanese to compete with the great land of cotton,—America.

It is only necessary to compare the average productions from here with those of America in order to see how unequal the competition is. In America an average of 340 lbs. is made and here in the most favourable case only 200 lbs. of clean cotton per bouw and furthermore the latter is of less value.

COTTON NOTE.

Mr. T. H. HILL writes: that in his correspondence on Cotton in the States Bulletin III, 3, p. 95, the following passage was omitted: —When the bolls open if there is rain, and they are neglected, the cotton gets black and mouldy and spotty and the seeds germinate here but, it has often occurred to me that when the bolls were matured; (a stage of growth it should not be impossible with practice to detect) they might be gathered, either singly or on the stem, and if then subject to the action of dry air, in a building, might complete the process of maturing and be of the very best quality, not even having had the dew on the exposed lint, *and absolutely free from dust*—a most important point in the value of cotton.

He adds that the italicised passage is the most important point as he sees daily.—*Editor.*

AGRI-HORTICULTURAL SHOW.

This show to be held at Kuala Lumpur August 5th, 6th and 7th promises well.

The exhibition, which is under the distinguished patronage of His Excellency the Governor and High Commissioner, the Sultans of the Malay States, the Resident-General, and others, will be opened by His Excellency at 11 a.m. on 4th August.

2. With a view to making the show as complete and as representative as possible, the exhibits will be classified in several divisions as follows, a special committee having been appointed for each division :—

Division A. "Agricultural Produce"
(Hon. Sec., Mr. L. C. Brown).

Division B. "Flowers, Fruits and Vegetables"
(Hon. Sec., Mr. H. E. Bryne).

Division C. "Stock and Dairy Produce"
(Hon. Sec., Mr. T. W. Clayton).

Division D. "Horses and Dogs"
(Hon. Sec., Mr. Sydney R. Smith).

Division E. "Native Industries and Manufactures: Implements and Miscellaneous"
(Hon. Sec., Mr. Herbert C. Robinson).

3. The prize lists can now be obtained on application to the following Standing Committee :—

STANDING COMMITTEE:

SINGAPORE.

Assistant Superintendent, Botanic Gardens, Singapore.
The Director of Botanic Gardens, S.S. (*Hon. Secretary*).

PENANG AND PROVINCE WELLESLEY.

The Senior District Officer, P. W.
The Collector of Land Revenue.
The Superintendent, Botanic Gardens and Forests (*Hon. Secretary*).

MALACCA.

The Collector of Land Revenue.
The Hon. the Resident Councillor (*Hon. Secretary*).

PERAK.

The Director of Museums, F.M.S.
The Superintendent, Government Plantations.
The District Officer, Kuala Kangsar (*Hon. Secretary*.

SELANGOR.

The Collector of Land Revenue, Kuala Lumpur.
The Chairman, United Planters' Association.
The Superintendent, Experimental Plantations (*Hon. Secretary*)).

NEGRI SEMBILAN.

The District Officer, Tampin.
The Collector of Land Revenue, Seremban.
The Chairman, Negri Sembilan Planters' Association.
W. H. Mackray, *Hon. Secretary*.

PAHANG.

The Senior Magistrate.
The District Officer, Raub.
The District Officer, Pekan.

4. The Committee will pay the cost of transport of approved exhibits and native exhibitors (except in division D, and exhibits Europeans) from all parts of the Colony and Federated Malay States. All exhibits and exhibitors will be carried free over the Federated Malay States Railways, and a reduction of 25% on the usual freight and passages will be granted by the Straits Steamship Company.

5. Any further information may be obtained from the Hon. Secretaries above-mentioned, the Hon. Secretary, General Purposes Committee (Mr. J. P. Swettenham), or the undersigned.

STANLEY ARDEN,
General Secretary.

MISCELLANEOUS.

Notices to Subscribers.

I. For the information of subscribers and others who have been unable to complete their series of the Agricultural Bulletin of the Straits and Federated Malay States notice is here given that Nos. 1, 7, 8, 9, of the Old Series (1891–1900) and Nos. 1, 8, 9, 10, of the New Series Vol. 1 (1901–1902), the first issues of which have long been exhausted, are now being reprinted, with plates, and will shortly be ready.

II. Subscribers whose subscriptions are still unpaid are requested to send in their subscriptions for the present year as soon as possible. Members of the United Planters Association are requested to send in their subscriptions in future directly to the Editor and not to the Secretary of the Association.

II. Subscribers outside the Peninsula will in future be charged $3.50 per annum instead of $3 in order to cover postage.

Meteorological Observers are asked to send in their returns to the Editor, to arrive before the 10th day of the following month if possible, so as to be in time for going to press.

Rainfall in the Duff Development Concession during 1903.

Registered at Kuala Lebir in Kelantan.

Month.	Total Rainfall.	Greatest rainfall during 24 hours.
1903.	Inches.	Inches.
May	2.35	.76
June	8.94	1.70
July	5.43	1.28
August	4.30	.97
September.	11.41	1.16
October	12.36	2.30
November.* ...	31.57	5.67
December	17.76	4.69

Note.—In the abstracts of Meteorological Readings which are attached the Temperatures given are the mean shade temperatures. The means have been arrived at by adding the daily maxima, minima and ranges together and dividing by the number of days in each month.

The instrument used is a variety of Six's Thermometer. It is kept on the wall of an open verandah.

The rain gauge is placed on the ground in an open space. It is a Symonds' gauge.

J. D. GIMLETTE.

* A phenomenal rainfall of 24.10 inches occurred between 22.11.03 and 29.11.03 inclusive.

Rainfall for May, 1904 :—

Government Hill	...	Ins.	6-89
The Fort	...	"	5-81
The Prison	...	"	7-72
Balik Pulau	...	"	4-06
Pulau Jerejak	...	"	7-39
Pangkor	...	"	3-70
Lumut	...	"	4-18
Bruas	...	"	4-36

M. E. SCRIVEN,

Assistant Surgeon,

Penang, 11th June, 1904. *Prison Observatory.*

PAHANG.

The Senior Magistrate.
The District Officer, Raub.
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Lumut	...	,,	4-18
Bruas	...	,,	4-36

M. E. SCRIVEN,
Assistant Surgeon,
Prison Observatory.

Penang, 11th June, 1904.

SINGAPORE MARKET REPORT.

June, 1904.

Articles.	Quantity sold.	Highest price.	Lowest price.
	Tons.	$	$
Coffee—Palembang - -	...	26.00	26.00
Bali - - -	37	22.50	21.00
Liberian - -	144	20.25	19.00
Copra - - -	2,383	8.60	7.60
Gambier - - -	2,781	8.87½	7.75
Cube Gambier, Nos. 1 & 2. -	317	14.75	11.00
Gutta Percha, 1st quality - -	...	200.00	150.00
Medium - -	...	190.00	90.00
Lower - -	...	120.00	12.00
Borneo Rubber - -	...	140.00	89.00
Gutta Jelutong - -	...	8.87½	8.35
Nutmegs, No. 110's - -	...	42.00	42.00
No. 80's - -	...	65.00	63.50
Mace, Banda - - -	...	110.00	110.00
Amboyna - -	...	85.00	80.00
Pepper, Black - - -	927	28.00	24.00
White - - -	520	41.50	34.00
Pearl Sago, Small - -	175	4.50	3.90
Medium - -	...	...	...
Large - -	...	...	...
Sago Flour, No. 1 - -	2,745	3.25	2.75
No. 2 - -	130	1.05	1.00
Flake Tapioca, Small - -	690	4.20	4.00
Medium - -	50	...	...
Pearl Tapioca, Small - -	596	4.20	4.05
Medium - -	824	4.20	4.05
Bullet - -	...	4.75	4.75
Tin - - - -	2,565	74.75	69.50

(*A*)

Exports from Singapore and Penang to Europe and America.

For fortnight ending 15th May, 1904.

Wired at 2.15 p.m. on 16th May, 1904.

			Tons Steamer.	Tons Sailing.
To England				
Tin	from Singapore & Penang	to England and U. K. optional any ports.	1,901	
Gambier	from Singapore	to London	...	
,,	,, ,,	,, Liverpool	560	
,,	,, ,,	to U. K. & / or Continent	270	
,,	,, ,,	to Glasgow	...	
Cube Gambier	,, ,,	,, England	...	
White Pepper	,, ,,	,, ,,	30	
Black ,,	,, ,,	,, ,,	30	
White Pepper	,, Penang	,, ,,	...	
Black ,,	,, ,,	,, ,,	160	
Pearl Sago	,, Singapore	,, ,,	90	
Sago Flour	,, ,,	,, ,, London	250	
,, ,,	,, ,,	,, ,, Liverpool	1'700	
,, ,,	,, ,,	,, ,, Glasgow	170	
Tapioca Flake	,, Singapore & Penang	to England	230	
,, Pearl & Bullets	,, ,,	,, ,, ,,	410	
,, Flour	,, Penang	,, ,,	300	
Gutta Percha	,, Singapore	,, ,,	...	
Buff hides	,, ,,	,, ,,	50	
Pineapples	,, ,,	,, cases	23,500	
To America.				
Tin	from Singapore & Penang		385	
Gambier	,, Singapore		280	
Cube Gambier	,, ,,		10	
Black Pepper	,, ,,		20	
,,	,, Penang		...	
White Pepper	,, Singapore		30	
,,	,, Penang		...	
Nutmegs	,, Singapore & Penang		3	
Tapioca, Flake & Pearl	,, ,, ,,		230	
Pineapples	,, ,, ,,	cases	150	
Sago Flour	,, ,, ,,		160	
To the Continent.				
Gambier	from Singapore	to South Continental Ports	320	
,,	,, ,,	,, North ,,	150	
Black Pepper	,, ,,	,, South ,,	70	
,,	,, ,,	,, North ,,	190	
Black Pepper	,, ,,	,, South ,,	20	
,,	,, ,,	,, North ,,	...	
White Pepper	,, ,,	,, South ,,	50	
,,	,, ,,	,, North ,,	180	

				Tons Steamer.	Tons Sailing.
White Pepper	from	Singapore	to South Continental Ports -	...	
,,	,,	,,	,, North ,, -	80	
Copra	,,	Singapore & Penang	to Marseilles -	620	
,,	,,	,, ,,	,, Odessa -	...	
,,	,,	,, ,,	,, South Continental Ports - (other than Marseilles and Odessa)	620	
,,	,,	,, ,,	,, North Continental Ports -	1,100	
Tin	,,	,, ,,	,, Continent -	280	
Tapioca Flake	,,	,, ,,	,, ,, -	280	
Tapioca Pearl	,,	Singapore	,, ,, -	330	
Cube Gambier	,,	,, ,,	,, ,, -	, 60	
Pineapples	,,	,, ,,	,, ,,	cases 1 250	
Sago Flour	,,	,, ,,	,, ,, -	1,025	

N.B.—By "South Continental Ports" are to be understood all inside and by "North Continental Ports" all outside Gibraltar,

1,800 tons Gambier
410 ,, Black Pepper
(*in Sidgapore*)
} contracted for during fortnight ending as above.

Telegraphed to A. A. Niblett, Ingram House, 165, Fenchurch Street, London E.C.

(*B*)

Exports from Singapore and Penang to Europe and America.

For fortnight ending 31st May, 1904.

Wired at 4 p.m. on 1st June, 1904.

To England.

				Tons Steamer.
Tin	from	Singapore & Penang	to England and U. K. optional any ports. -	1,225
Gambier	from	Singapore	to London -	...
,,	,,	,,	,, Liverpool-	...
,,	,,	,,	to U. K. & / or Continent -	725
,,	,,	,,	to Glasgow -	...
Cube Gambier	,,	,,	,, England -	...
White Pepper	,,	,,	,, ,, -	30
Black ,,	,,	,,	,, ,, -	...
White Pepper	,,	Penang	,, ,, -	20
Black ,,	,,	,,	,, ,, -	70
Pearl Sago	,,	Singapore	,, ,, -	90
Sago Flour	,,	,,	,, London -	170
,, ,,	,,	,,	,, Liverpool-	100
,, ,,	,,	,,	,, Glasgow -	...
Tapioca, Flake	,,	Singapore & Penang	to England	260
,, Pearl & Bullets	,,	,, ,,	,, ,, -	230
,, Flour	,,	Penang	,, ,, -	825

			Tons Steamer.	Tons Sailing.
Gutta Percha	from Singapore	to England	30	
Buff hides	,, ,,	,, ,,	40	
Pineapples	,, ,,	,, ,,	cases 7,000	
To America.				
Tin	,, Singapore & Penang		681	
Gambier	,, Singapore		1,050	100
Cube gambier	,, ,,	,,	90	10
Black Pepper	,, ,,		80	
,,	,, Penang		...	
White Pepper	,, Singapore		40	
,,	,, Penang		...	
Nutmegs	,, Singapore & Penang		6	
Tapioca, Flake & Pearl	,, ,, ,,		290	950
Pineapples	,, ,,		cases 500	
Sago Flour	,, ,, ,,	,,	350	
To the Continent.				
Gambier	from Singapore	to South Continental Ports	...	
,,	,, ,,	,, North ,,	20	
Black Pepper	,, ,,	,, South ,,	10	
,,	,, ,,	,, North ,,	...	
Black Pepper	,, Penang	,, South ,,	...	
,,	,, ,,	,, North ,,	...	
White Pepper	from Singapore	to South Continental Ports	...	
,,	,, ,,	,, North ,,	...	
,,	,, Penang	to South Continental Ports	10	
,,	,, ,,	,, North ,,	...	
Copra	,, Singapore & Penang	to Marseilles	...	
,,	,, ,,	,, Odessa	...	
,,	,, ,,	,, South Continental Ports other than Marseilles and Odessa	200	
,,	,, ,,	,, North Continental Ports	100	
Tin	,, ,,	,, Continent	335	
Tapioca Flake	,, ,,	,, ,,	20	
Tapioca Pearl	,, ,,	,, ,,	...	
Cube gambier	,, Singapore	,, ,,	...	
Pineapples	,,	,, ,,	cases 500	

N.B.—By "South Continental Ports" are to be understood all inside and by "North Continental Ports" all outside Gibraltar.

900 tons Gambier
400 ,, Black Pepper (*in Singapore*) } contracted for during fortnight ending as above.

Telegraphed to A. A. Niblett, Ingram House, 165, Fenchurch Street, London, E. C

Singapore.

Abstract of Meteorological Readings for the month of May, 1904.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew point.	Humidity.			
	Ins.	°F.	°F.	°F.	°F.	°F.	°F.	Ins.	°F	%		Ins.	Ins.
Kandang Kerbau Hospital Observatory	29·856	142·0	81·4	88·2	74·4	13·8	78·6	·901	76·7	78	SE. & SSE.	4·10	1·90

K. K. Hospital Observatory,
Singapore, 13th June, 1904.

A. B. LEICESTER,
Meteorological Observer.

D. K. McDOWELL,
Principal Civil Medical Officer, S.S

Penang.

Abstract of Meteorological Readings for May, 1904.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
	Ins.	°F	°F	°F	°F	°F	°F	Ins.	°F	%		Ins.	Ins.
Criminal Prison Observatory	29·871	146·7	80·7	90·8	74·9	15·9	75·5	·788	69·33	70	N.W.	7·72	2·48

Colonial Surgeon's Office,
Penang, 10th June, 1904.

M. E. SCRIVEN,
Asst. Surgeon.

T. C. MUGLISTON,
Colonial Surgeon, Penang.

Malacca.

Abstract of Meterological Readings for May, 1904.

DISTRICT,	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
	Ins.	°F	°F	°F	°F	°F	°F	Ins.	°F	%		Ins.	Ins.
Durian Daun Hospital.	29·829	161·6	79·3	89·7	70·3	19·7	81·1	10·49	70·3	94	N.E.	3·87	1·63

Colonial Surgeon's Office,
Malacca, 29th June, 1904.

F. B. CROUCHER,
Colonial Surgeon, Malacca.

Perak.

Abstract of Meteorological Readings for May, 1904.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
Taiping ...	...	154	82·89	93	71	22	77·77	882	...	79	...	19·73	5·30
Kuala Kangsar ...	...	...	80·91	93	70	23	76·53	856	...	81	...	8·38	1·65
Batu Gajah ...	...	158	81·60	93	71	22	77·10	871	...	81	...	8·71	1·41
Gopeng ...	...	...	80·97	92	63	29	76·84	868	...	82	...	6·45	1·34
Ipoh ...	...	...	82·08	94	71	23	77·28	874	...	80	...	5·95	·98
Kampar ...	...	...	...	92	68	24	...	...	...	...	..	6·05	1·31
Teluk Anson ...	...	...	82·41	92	69	23	77·21	866	...	78	...	7·35	1·40
Tapah ...	...	...	81·30	94	68	26	76·83	862	...	81	...	10·92	1·93
Parit Buntar ...	...	...	82·29	92	72	20	77·73	889	...	81	...	5·84	1·42
Bagan Serai ...	...	...	81·64	91	71	20	76·95	866	...	80	...	3·14	·76
Selama ...	...	...	81·54	90	72	22	77·83	903	...	84	...	11·67	2·00

State Surgeon's Office,
Taiping, 13th June, 1904.

M. J. WRIGHT,
State Surgeon.

Selangor.

Abstract of Meteorological Readings in the various Districts of the State, for May, 1904.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature. Mean Dry Bulb.	Temperature. Maximum.	Temperature. Minimum.	Temperature. Range.	Hygrometer. Mean Wet Bulb.	Hygrometer. Vapour Tension.	Hygrometer. Dew Point.	Hygrometer. Humidity.	Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
General Hospital, Kuala Lumpur	29·871	150·8	80·1	89·2	67·0	22·2	76·4	0·841	74·0	82	S.W.	10·03	3·34
Pudoh Gaol Hospital ,, ...	...	...	...	...	...	...	...	...	...	...	...	8·47	2·71
District Hospital ,, ...	...	...	...	...	...	...	...	...	...	...	...	9·60	4·08
District Hospital Klang	...	...	...	86·7	74·5	12·2	...	...	...	...	...	10·18	4·77
,, Kuala Langat	...	...	...	87·3	71·3	16·0	...	...	...	...	...	7.22	1·74
,, Kajang	...	...	...	94·6	70·3	21·6	...	...	...	...	...	2·48	0·73
,, Kuala Selangor	...	...	...	87·5	76·1	11·4	...	...	...	...	...	6·31	2.05
,, Kuala Kubu	...	...	...	92·8	72·3	20·5	...	...	...	...	...	11·92	2·33
,, Serendah	...	...	...	...	...	...	...	...	...	...	...	6·85	1·77
,, Rawang	...	...	...	87·3	73·9	13·4	...	...	...	...	...	6·57	2·28
Beri-beri Hospital, Jeram	...	...	...	...	...	...	...	...	...	...	...	6·92	3·66
Ulu Gombah	...	...	...	...	...	...	...	...	...	...	...	6·87	1·80
Sabah Bernam	...	...	...	...	...	...	...	...	...	...	...	7·69	1·84

State Surgeon's Office,
Kuala Lumpur, 15th June, 1904.

E. A. O. TRAVERS,
State Surgeon, Selangor.

Pahang.

Abstract of Meteorological Readings in the various Districts of the State, for the month of May, 1904.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
Kuala Lipis ...	...	...	...	96·0	68·0	20·48	...	...	...	...	...	6·15	1·39
Raub ...	...	...	...	93·0	68·0	17·08	...	...	...	...	...	7·06	2·70
Bentong ...	...	...	...	96·0	68·0	19·02	...	...	...	...	...	6·39	1·40
Pekan ...	...	...	...	94·0	71·0	17·04	...	...	...	...	...	5·47	1·31
Kuantan ...	...	...	...	84·0	70·0	14·00	...	...	...	...	...	5·39	1·20
Temerloh ...	...	...	...	94·0	72·0	22·00	...	...	...	...	N.W.	1·51	·44

S. LUCY,
State Surgeon, Pahang.

Kuala Lipis, 21st June, 1904.

Muar.

Abstract of Meteorological Readings for May, 1904.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
Lanadron Estate.	...	...	86	93	71	22	76	...	...	...	...	4·48	1·26

Muar, 5th June, 1904.

ROGER PEARS.

Kelantan.

Abstract of Meteorological Readings in the Duff Development Concession from December 1903 to May 1904.

District.		Temperature.			Rainfall.	
		Maximum.	Minimum.	Range.	Total Rainfall.	Greatest rainfall during 24 hours.
	1903.	°F	°F	°F	Inches.	Inches.
Kuala Lebir	December, ...	80.95	70.2	10.75	17.76	4.69
	1904.					
	January ...	82,01	70.01	12.0	7.40	1.19
	February ...	86.03	67.09	18.4	.04	.02
	March ...	91.05	67.09	23.6	1.57	0.78
	April ...	90.62	70.82	19.8	6.18	1.16
	May ...	90.09	71.02	19.7	4.72	.92

Kuala Lebir, Kelantan.

JOHN D. GIMLETTE.

No. 7.] JULY, 1904. [VOL. III.

AGRICULTURAL BULLETIN

OF THE

STRAITS

AND

FEDERATED MALAY STATES

EDITED BY
H. N. RIDLEY, M.A., F.L.S.,
Director of Botanic Gardens, S. S.

CONTENTS.

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NOTICE.

The Scientific and Technical Departments of the Imperial Institute.

His Excellency the Governor has received a despatch from the Right Hon'ble the Secretary of State for the Colonies calling attention to the advantages offered by the Imperial Institute to Merchants, Planters and others, who may wish to have samples submitted to scientific experts for opinion as to their commercial value, &c. The following extracts from a Memorandum published by the Authorities of the Imperial Institute will give an idea of the work undertaken and carried on there.

"The Scientific and Technical Department of the Institute has "been established to acquire information by special enquiries and "by experimental research, technical trials and commercial valua-"tion regarding new or little known natural or manufactured pro-"ducts of the various Colonies and Dependencies of the British "Empire and of Foreign Countries, and also regarding known "products procurable from new sources, and local products of "manufacture which it is desired to export. This work is carried "out with a view to the creation of new openings in trade, or the "promotion of industrial developments."

2. In an extensive and well equipped series of Research Laboratories, a numerous staff of skilled chemists under the direction of Professor Wyndham R. Dunstan, M.A., F.R.S., carry out the investigation of the chemical constitution and properties of new dye-stuffs, tanning materials, seeds and food-stuffs, oils, gums and resins, fibres, timbers, medicinal plants and products, with a view to their commercial utilization. Whenever necessary these materials are submitted to special scientific experts, by whom they are made the subject of particular investigation or practical tests. Reports are also obtained from technical or trade experts in regard to the probable commercial or industrial value of any such products, while full information is collected from official or other trustworthy sources regarding the probable extent and cost of available supplies.

Reports on the results of enquiries or experimental investigations are supplied as a rule, without charge, but should special expenses be incurred in connection with any such reports, or with the commercial value of particular materials or manufactured products, which the Council do not consider themselves warranted in meeting, a statement of such outlays will be furnished, for repayment, when the Reports are supplied. Should an investigation or report of exceptional character be asked for by a Government Department, an estimate of the attendant expenses will be submitted, with a view to ascertain whether authority for such expenditure will be given.

3. The Federated Malay States Government has undertaken to grant a sum of £100 a year for 5 years to the Department with a view to the careful investigation and commercial development of the mineral resources of the States.

The Government Geologist is collecting specimens for chemical examination and after analysis the Imperial Institute which is in very complete touch with the principal manufacturing and other industries of the United Kingdom, will bring the specimens before manufacturers and others for trial with a view to their commercial development.

It is expected that this action will do much to help in finding a market for new products and developing the markets for those already exploited.

AGRICULTURAL BULLETIN

OF THE

STRAITS

AND

FEDERATED MALAY STATES.

No. 7.] JULY, 1904. [VOL. III.

THE PALM COLLECTION OF THE BOTANIC GARDENS, SINGAPORE.

Palms whether considered for their economic value or decorative appearance are among the most interesting and beautiful plants for the Tropics and are everywhere popular so that a few brief notes on the Singapore collection may be of general interest. A list of this collection is attached which includes 90 genera and 236 species and shows what kinds can be procured at the Botanic Gardens, Singapore.

Distribution.—Of the distribution of palms throughout the world the largest number are found in the New World, from the southern United States to Chili, the head quarters of this region being the West Indies, Guiana and Brazil. This region contains a good number of the *Arecineæ*, many of the *Corypheæ*, and nearly all the *Cocoineæ*.

The Malayan region comes next, and the Polynesian Islands contain a good many. Africa is very poor in palms containing only the dates, *Phœnix*, *Raphias* and *Hyphænes*, the well known oil-palm *Elais Guineensis*, and a few little known genera, but there are more in the Mascarene Islands, and the small groups of *Borassineæ* is almost confined to Africa and its Islands. India, Ceylon, and Australia are poor in palms.

Malay Palms.—Of the Malay region the Peninsula is particularly rich in palms of great variety both in size and form, from the small *Licuala triphylla*, sometimes hardly more than a foot high, to the tall *Oranias*, *Oncospermas*, *Livistonas* and *Caryotas*, often 60 feet high, and the long climbing rattans (*Calamus*, *Plectocomia*, and *Korthalsia*) often 150 feet and more in length; the unique red stemmed palm, *Cyrtostachys Lakka*, the noble Daun Payong, *Teysmannia altifrons*, the superb-leaved Teruno, *Iguanura spectabilis*, and the handsome, although shy, Kerintin, *Ptychoraphis Singaporensis*.

The Collection.—As will be seen from the list, the Singapore garden collection of palms is an extensive one and specimens from most countries are represented. The most conspicuous are the

avenue of *Arenga saccharifera,* (kabong or sugar palm Malayan), Red Stem-Palm avenue (*Cyrtostachys Lakka* Malayan), avenue of *Rhopaloblaste hexandra* Java, avenue of *Sabal Palmetto* West Indies, and the rows of *Archontophœnix Alexandræ* Queensland palm, *Ptychosperma McArthuri,* Trop Australia, and *Caryota urens* (East Indian Wine Palm). Of solitary specimens the clumps of Sago Palm (*Sagus lævis*), Chinese Palm (*Rhapis flabelliformis*), from Madagascar *Raffia Ruffia,* the local Nibong *Oncosperma tigillaria*, local Palas *Licuala spinosa*, and from Mexico *Bactris major* are also conspicuous. Of single specimens, *Areca pumila*, *Pinanga Kuhlii*, *Actinorhytis calapparia*, *Dictyosperma album*, *Euterpe oleracea*, *Ptychoraphis angusta*, *Oreodoxa regia*, *Calyptrocalyx spicatus*, *Stevensonia grandifolia Verschaffeltia splendida*, *Wallichia disticha*, *Dypsis pinnatifrons*, *Corypha umbraculifera*, *Livistona australis*, *Livistona chinensis*, *Chrysalidocarpus lutescens*, *Calamus Lindeni*, *Calamus ciliaris*, *Calamus leptospadix*, *Plectocomia elongata*, *Elæis guineensis*, *Cocos flexuosa*, *Cocos plumosa*, *Attalea cohune*, *Latania Commersonii*, *Korthalsia Junghuhnii*, *Phœnix rupicola*, *Phœnix farinifera*, *Korthalsia polystachya*, *Dæmonorops calicarpus* and *Astrocaryum tucumoides* are especially fine.

Cultivation.—Although far the greater number of palms are natives of tropical regions a small number inhabit cooler, sub-tropical, or almost temperate regions. Such are *Chamærops humilis* of Southern Europe, *Nannorhops Ritchieana* of Afghanistan, *Trachycarpus excelsus* of Japan, *Raphis humilis* of Japan, *Kentia sapida* of New Zealand, and *Pseudophœnix Sargentii* of Florida.

These cooler climate palms are much less easy to cultivate here and seldom thrive when planted out, although they may be kept as pot or tub plants for a long time.

There are a few desert palms which are also very difficult to grow on account of our heavy rainfall, such are the *Hpyhænes,* the common date, (*Phœnix Dactylifera*), which, however, can be made to grow but has never flowered with us. The *Borassus*, known as the Palmyra palm and by natives the Lontar, introduced to India from Africa and thence to the Peninsula, thrives near the sea in sandy places, but seems difficult to grow far inland, and even in the dryer parts of Singapore is not at all easy to grow satisfactorily. The Nipa palm so abundant in our tidal swamps does not grow well away from salt mud.

Exclusive of these almost all the palms from different parts of the world which have been introduced into Singapore have done well and many have flowered and fruited successfully and are readily cultivated.

Seeds.—Generally speaking palms are reproduced from seeds, in a few instances propagation by means of division or root cuttings is the method adopted. The principal genera from which root cuttings may be obtained are:—*Pinanga*, *Cyrtostachys*, *Oncosperma*, *Iriartea*, *Oenocarpus*, *Chamædorea*, *Chrysalidocarpus*, *Wallichia*, *Arenga*, *Caryota*, *Nipa*, *Licuala*, *Rhapis*, *Calamus*, *Zalacca*, *Korthalsia*, *Raphia*, *Bactris*, *Desmoncus*, *Astrocaryum* and *Sagus*. With these

an underground creeping *rhizome* produces a new growth and it is best to cut or ring this rhizome behind the growth and when a tuft of roots has been formed the cutting may be removed. Root cuttings, however, seldom make nice shapely plants, the process is usually a slow one and the percentage of loss generally heavy, for these reasons when procurable seeds are always preferred.

In collecting palm seeds it is essential that the seed should be perfectly ripe. This is generally easily determined by the hardness of the seed, that is to say of the albumen, and also by the colour and softness of the fruit, occasionally the albumen seems to be fairly hard before the fruit is ripe enough to germinate. The colour of the fruit is often a help, thus, in *Iguanura* the fruit is first white, then becomes red, and at last black, and when it has arrived at this colour only it is ripe enough for collecting. Seed taken as it often has to be when travelling in the woods just before it is ripe will sometimes continue its ripening in sawdust damped and eventually be fit to plant.

It appears from the number of dry seed received even from Botanic Gardens that persons think that because a palm seed is very hard, it can safely be sent to a long distance quite dry without any packing material at all, this is a great mistake. The small embryo placed in a hollow of the hard albumen at one end or on the side of a seed is very sensitive to drying, and very readily perishes. Palm seed should always be packed for travelling in damp powdered charcoal if possible, or damp sawdust or earth. In the forests damp earth may be used, either put into a tin box, or if more convenient a mud ball may be made in which the seeds are pushed and covered up, thus they will keep for a long time.

The fruits of palms may be fleshy, fibrous or even woody, and a few have a spiny spathe which has to be guarded against. Fleshy fruits soon ferment and the pulp is easily removed. Fibrous fruits may be macerated for a day or two when the outer covering can be split or peeled off. The Malayan palm "Kabong" or "Gula Malacca" is one of the worst to handle, the juice from the fruits being a skin poison. The *Kitool*, (*Caryota urens*) is also a powerful irritant on the skin. Many palms germinate freely when left to themselves, under cultivation however it is best to remove the outer covering of the seed because of the decay of the pulp or fibrous covering and possible loss from fungus. The period of germination varies from 6 weeks with some to 3 or 4 years with others. Excepting, those palm requiring much space, Coco-nuts, Sago, it is best to plant seeds in pots or boxes, whichever is used the drainage should be deep and well covered with half decayed leaves to prevent the compost from blocking up the drainage. The compost to be used should be free from fungi and consist of burnt earth, well decayed leaf-mould, some sand, and a little powdered charcoal. Seeds may be planted fairly close, small seeds placed upright, large seeds on one side or flat, and covered with one-half to one inch of the prepared compost which has been passed through a sieve of a fine mesh. After planting the pots or boxes should be thoroughly

watered (saturated) placed in a moderately damp situation and afterwards sufficiently sprinkled so as never to be over wet or too dry. Palm seeds when planted must be guarded from rats and mice, and white ants, the surface soil inspected, and excessive damp and fungus removed. The growth is often at first very slow (this is especially noticeable in rattans) but after a year or two the growth increases much more rapidly.

Seedlings.—With most of the best known palms seedlings may be described as fairly hardy and only ordinary attention is necessary to produce strong plants, most failures occur through excessive damp or watering, and the moisture remaining in the axils of the leaves or the surface soil is too damp in which case the seedling perishes. A few species of palms have been introduced to cultivation by seedlings collected in the jungle of which seeds have not been procurable. Owing to the different conditions under which such seedlings have germinated care must be taken to wrap the roots in mud immediately on lifting them and the seedlings dug up with a good ball of earth attached to them. The little plants must be kept very moist till they can be planted, and not allowed to get dry by exposure to the sun or they speedily perish. Some jungle palms stand transport fairly well, especially rattans and with some species it is the only way to get them.

Re-potting.—As soon as seedling palms have filled their pots with roots, the young plants should be transplanted or re-potted into single pots and a strong compost used. Some loamy soil, well decayed cow manure and leaf-mould, some sand and burnt earth, all well mixed together and passed through a moderately coarse sieve. Let the drainage be sufficient and placed carefully. All loose and old sour soil removed from the plants, the roots inspected if sound and free from pests, keep lightly syringed for a few days and water sparingly until the plants are established. Palms succeed best when potted or planted deeply, unlike flowering plants the lower roots of palms in thickening raise the plant, and the surface or adventitious roots grow upwards. In re-potting or tubbing very strong plants of which the roots have become tightly bound together it is not necessary to disturb the ball or place new drainage underneath it, but a little additional drainage could be placed round the base, and although the plants may appear deeply tubbed at first the surface roots will soon appear on the top.

Selection.—Many palms particularly tall erect growing species make only poor pot or tub specimens and are only seen to advantage when cultivated in the open, other palms not only make handsome tub specimens but are quite unsuited for outside culture in Singapore, of such the following may be mentioned:—*Iguanura*, *Teysmannia*, *Pritchardia*, *Licuala grandis*, *Licuala ferrugirea*, *Rhapis humilis*, *Thrinax*, and *Hyphœne*.

For table and house decoration the following are best to cultivate:—*Ptychosperma McArthuri*, *Ptychosperma Sanderiana*, *Rhopaloblaste hexandra*, *Chrysalidocarpus lutescens*, *Heterospatha elata*, *Stevensonia grandifolia*, *Verschaffeltia splendida*, *Hyophorbe amari-*

caulis, *Arenga Engleri*, *Phœnix rupicola*, *Licuala peltata*, *Livistona australis*, *Livistona chinensis*, *Thrinax barbadensis*, *T. parviflora* *Calamus ciliaris*, *Calamus Lindeni*, *Martinezia*, *caryotæfolia* and *Cocos plumosa*.

Excepting those already mentioned nearly all palms can be grown in the open air and indeed only in the open air is their real beauty most apparent, apart from their lofty crowns and slender stems as with the *Livistonas*, the sturdy trunk of the Royal Palm (*Oreodoxa regia*) or the graceful leaves of the *Caryotas* resembling gigantic ferns, the fruiting period adds another charm. No better instance of the difference and adornment of its fruit to a palm could be cited than that of *Seaforthia elegans*, when not in fruit it resembles many of its congeners, when in fruit it is surpassingly beautiful.

In outside culture the question of shade is of the first importance, although so many palms grow outside so readily few, if any, grow so well as when planted in shaded aspects or under partial shade, and some become quite unsightly when fully exposed. Among the principal *genera* requiring shade are *Pinanga*, *Ptychoraphis*, *Howea*, *Chamædorea*, *Geonoma*, *Bentinckia*, and *Latania*. Others are much improved by slight shade which may be obtained by planting in clumps, of these the principal genera are *Dictyosperma*, *Ptychœoccus*, *Chrysalidocarpus*, *Heterospatha*, *Stevensonia*, *Verschaffeltia*, *Dypsis*, *Hyophorbe*, *Wallichia*, *Caryota*, *Sabal*, *Licuala*, *Bactris*, *Desmoncus*, *Astrocaryum*, and *Cocos* excepting the Coco-nut.

To obtain their best appearance, palms require well manuring and few plants respond more readily to liberal treatment in this respect than do palms. As palms are surface feeders manure may be applied by mulching, old farm and stable manure is excellent, and well decayed leaf soil or burnt earth is also beneficial. In stiff and poor sandy soils, it is an advantage to open a trench round the palm and fill in with manure. Where farm manure is abundant chemical manures are not necessary and are only seldom used. Liquid manures are always efficacious.

Fruiting.—Some palms fruit very soon, as soon as they have reached a fair growth, others take many years. The unisexual palms *Phœnix*, *Phytelephas*, *Calamus* and some *Dæmonorops* cannot of course produce fruit unless there are both sexes within easy reach of each other, and are thus more difficult to propagate.

Rhopaloblaste often flowers for several years before producing its beautiful fruit. The plant is not unisexual but as the male and female flowers on the inflorescence do not open at the same time, the females do not get fertilised, unless there is also an inflorescence with male flowers fully expanded at the same time in the neighbourhood. A few palms which are constantly in flower here, have never produced fertile fruits for what reason is not clear such are *Oncosperma fasciculata*, and *Loxococcus rupicola*, both from Ceylon.

Fertilization of the flowers of palms is effected almost exclu-

sively by bees including the genera *Apis*, and especially the little *Trigonas* (*Kelulut*).

Corypha is a truly monocarpic palm. It takes many years to gain its full growth, when it produces at the summit of the stem a great mass of inflorescence, after which the palm completely dies. The *Arengas* and *Caryotas* also die after flowering. The single stemmed ones *Arenga saccharifera*, *Caryota Cumingi*, etc., completely, while in the tufted species *Arenga Westerhouti*, *Caryota mitis*, the stem that is fruiting alone dies. The flowering in these palms when full grown commences near the top, every joint producing an inflorescence, alternately male and female till the flowers get near the base of the tree when it dies. In Sagus the stems rising from a creeping rhizome on attaining their full development produce a great terminal mass of inflorescence after which the leaves fall off and the stem dies to the base.

Pests and Diseases.—Palms both in pots or tubs and also when planted out are liable to the attacks of some insects. The caterpillar of the butterfly *Erionota Thrax* attacks the leaves especially of Rattans, *Livistona*, and some other palms. The caterpillar is about two inches long, pale sea green but entirely covered with a white mealy powder. It rolls up the leaves and gradually devours them. The same insect eats the leaves of Bananas (*see* Bulletin old series, p. 259). It should be sought for and destroyed by hand. The caterpillar of the large coconut butterfly (*Amathusia phidippus*) attacks other palms than coconuts, biting away all the leaflet except the midrib and giving the plant a ragged appearance. It seldom gives trouble with pot or tub palms but attacks full grown palms. I have however found one larva in a box of seedlings of *Phœnix* which it was steadily eating up. It is a smooth bright green caterpillar with a broad head and two long projecting spikes on its tail. It should be removed by hand, in the case of small plants. With fully grown trees it is much more difficult to deal with, but it is a comparatively harmless insect except to small plants. The Red Palm Beetle *Rhyncophorus ferruguiens*, and the Rhinoceros beetle *Oryctes Rhinoceros*, both attack many other palms than the Coco-nut. It is not common for the former to attack plants in pots or tubs, but I have met with larvæ in comparatively small plants in pots. The beetle is well known. A large black weevil with bright red markings. The eggs are laid in the bud of the palm and the large fleshy grub burrows in the soft parts of the bud, and often its presence is first observed by the falling of the young central leaf. In the case of single stemmed palms, the injury is usually fatal, but in the case of Dates, (*Phœnix*) the plant usually recovers. As a rule the beetle lays its eggs in number in proportion to the size of the palm, *e.g.*, in small palms one grub only may be found, while 12 or more may be taken from a badly infested tree. In the case of a large palm attacked it may be saved by a free operation. The leaves are carefully cut away, and the grubs extracted. So long as the actual growing point is not destroyed the sheaths of the young leaves may be cut down almost on to it. After all grubs

have been removed, a mat bag should be put over the top to keep off rain till the new shoot appears. This was done successfully in the Gardens to a fine *Oreodoxa regia*, which was badly infested and which very soon recovered and is now a fine tree.

Another much larger species of *Rhynchophorus*, entirely bright red above and black beneath is not rare attacking adult palms especially *Oncospermas*. It should bed estroyed in the same manner.

The trees usually attacked by these beetles are *Oncospermas*, *Verschaffeltia*, *Stevensonia*, *Archontophœnix*, *Cocos*, *Attalea*, *Oreodoxa*, *Livistona*, *Sagus*, *Phœnix*. I have never seen *Arecas*, *Licualas*, *Pinangas*, or the smaller palms attacked.

The Rhinoceros beetle damages palms in the same way, but in this case it is only the adult which burrows into the shoot, and so destroys the palm. The larvæ usually live in cowdung or decaying leaves or wood, and piles of this in a garden may produce a crop of these pestilential insects. These beetles should be looked for when a palm either exudes a gummy material from the bud, or there are signs of the mass of fibre torn up by the beetles among the leafsheaths. The insect can then be speared with a bamboo spear, and a little salt thrown into the hole will keep away others. It is a good plan to leave the dead beetle in the hole it has made, as the corpse attracts ants and these keep off the next comer.

Occasionally a palm in a tub looks sickly from no very clear reason, but if the earth be turned out of the tub, it will be found full of the grubs of a small chafer, dirty blackish looking grubs with a brown hard head. These are the larvæ of *Cetonica Mandarinea*, a small dark olive black chafer with gold markings, which is usually to be found not far off the infected plant eating the leaves of other plants or shrubs. These grubs eat the roots of the palms and so make them sickly. The plant should be turned out of its pot or tub and the soil changed, and the grubs destroyed.

There are several very troublesome kinds of beetles which attack palms especially young ones and pot palms, by burrowing in the sheath of the leaves. The palm looks sickly and the leaves when produced are spotted and injured. These small beetles belong to the group *Hispidæ*. One *Oxycephalus*, sp. is a little over $\frac{1}{4}$ inch long, the antennæ $\frac{1}{8}$ inch or less black, head small black, thorax raw, sienna oblong punctate, Elytra narrow much longer, black, with about eight longitudinal ribs with a row of dots between each rib. Legs short reddish. Body every flat, a somewhat similar insect living with this is a species of *Wallacca*.

Besides these there is one if not more species of small flattened weevils which live between the sheaths of the palms and the shoot. The larvæ of one species is $\frac{3}{16}$ inch long, thick, cylindric and maggot-like, sprinkled with a few hairs white, head pale brown. The beetle is long with a fairly long beak, and small dark brown head, thorax long, conic, punctate, black. Elytra black, truncate, shorter than the body, 5-6 ribbed punctate with a yellow spot on each

shoulder and one near the tip, antennæ shorter than the beak, clubbed blackish brown. Legs and abdomen brown.

This set of beetles is most troublesome and difficult to deal with, hidden under the sheaths they easily escape almost all insecticide. To deal with them, the plants must be thoroughly cleaned, the dead sheaths removed and the insects destroyed. Then a solution of Calverts carbolic soap, eight ounces to a gallon of water is dropped among the leaves which expells them. A decoction of pine-apple-leaves in water is also very efficacious.

Grasshoppers are often troublesome to young palms, and the worst is a very small species of *Tettix*, a little brown grasshopper which looks like a small piece of dirt, about $\frac{1}{4}$ inch long. It is usually in great force just before sundown. Small butterfly nets, or the favorite Malay method of catching these insects with a stick dipped in birdlime (the latex of the Jack tree or of Getah Terap) are the best methods of dealing with this class of pest.

Scale is common on young palms as well as old ones, as are Coccids. The presence of a nest of Keringas, (*Formica smaragdina*,) is a certain sign of the palm's being infested by one or other of these pests. Tobacco and soft soap or Calverts Carbolic soap may be rubbed over the scales and will destroy them.

Thrips is very common occasionally on seedlings. It produces spots on the leaves, and spoils their appearance. The Carbolic soap will evict them.

Economic uses.—Of important industries from palms the best known are:—Coco-nuts, Rattans; Palm-oil; (Elæis) Sago; Dates; Betel-nuts; Pissaba, and Timbers. In almost all tropical countries there is a large local trade in various articles obtained from palms. It is the subsidiary products however that are so very interesting.

Inflorescence.—Commencing with the flowers or inflorescence, toddy is obtained by cutting the ends of the spadices (flower and fruit branches) and is furnished by Coco-nuts; Kabong, Gula Malacca, (*Arenga saccharifera*) Dates; *Phœnix* and *Hyphæne*; *Palmyra; Borassus*; *Talipot Corypha*; *Kitul; Caryota*; Oil-Palm; Elæis and others. A cool pleasant beverage when fresh and an ardent spirit (arrack) when fermented and distilled. Vinegar can also be prepared instead of arrack, or, before fermented, palm sugar or Jaggery, and also starch, by boiling down. In the Straits the leaven used by bakers is obtained from Coco-nut toddy, and gula Malacca from *Arenga*. (It may be remarked that toddy can be obtained by tapping the trunk as is still done with the dates in parts of India and Africa, but is generally considered too destructive).

Some genera supply edible fruits, the most important being the Coco-nuts and Dates, others are Buah Salak, (*Zalacca*), *Euterpe*, *Erythea*, *Bactris*, *Astrocaryum*, *Calami* and several other genera, in fact nearly all produce fruits which are eaten by birds, bats, monkeys, squirrels and rats.

Valuable oils so largely used in soap, candles, margarine, are ex-

pressed from the seeds of several species, the most important and best known are Coco-nut oil, Palm-oil, (Elæis), Date-oil, (*Phœnix*); Cohune-nut, (*Attalea*), the residuum being used as a meal for fodder and also as manure.

Of the woody or bony seeds, Coco-nuts and the double Coco-nuts, Coco-de-Mer are used as utensils and ornaments, and smaller seeds notably Ivory-nut *Phytelephas*, and Coquilla-nut *Attalea*, and *Acrocomia* are used as buttons, necklaces, tops, and other ornaments and articles.

Dragon's blood used as a coloring matter and also in making incense, is obtained from the scales of the fruit of several species of *Dæmonorops* (Rotan Jerenang).

Coir or Coco-nut fibre is obtained from the fibrous husk of the coco-nut, not from the leaf-sheath as with other palm fibres. The seed of the Betel-nut is well known throughout the East being universally chewed by natives, and is also exported for use as a dentifrice and for medicine.

The spathe or floral envelope of some species is sometimes used as a wrapper, and lastly the pliable fibrous spadices of the inflorescence, after the fruit has fallen, are tied into bundles and used as brooms.

Bud.—From the base of crown, or the leaf axis the growing point or bud of some species is highly prized as a vegetable or condiment and is termed palm cabbage. The cabbage of coconut is excellent as is also that of mountain cabbage, *Euterpe oleracea*, Cabbage Palmetto, Sabal Palmetto, and also Oreodoxa, and in a lesser degree several other species.

Leaves.—Palm leaves have many uses and throughout the tropics are everywhere valued for thatch. In the Malay Peninsula the best thatch or attaps are Rumbia *Sagus lævis* (which when well made and carefully fixed) will last 5 years, Nipah, Coconut, Bertam, (*Eugeissoma* tristis), and Palas, (Licuala). Fans and umbrellas are among the uses of palm leaves as the names so often imply in many countries, and locally Daun payong, umbrella leaf, (*Teysmannia*). Other uses of leaves are baskets, sleeping mats, brushes, ornaments, and straw for plaiting and used for baskets and hats. From the leaves of *Copernicia* and *Ceroxylon* a waxy deposit is obtained and used for moulding and also made into candles.

In some species the midrib of the leaflet is useful as is instanced in the coconut which furnishes a common broom of the Straits. The petiole or midrib of the leaf has many uses such as arrows, spears, fishing rods, walking sticks, sandals and fancy articles, and the leaf sheath, the lower sheathing extremity which surrounds and fixes a leaf on its stem, is in many species especially tough and largely used in the Colonial bazaars as a wrapper instead of paper or handbaskets, and by natives for carrying food and even liquids, and for baskets and other utensils. In Malaya the best are Coco-nut, and Betel-nut. From other species, hats, brooms, cordage and various articles are obtained.

In some palms the leaf-sheath is broken up into a fibrous web as in the Coconut and Kabong, (Arenga) which is valuable as fibre for ropes, cordage, brushes and brooms. The well known bath broom is made from the stiff fibres of the South American Pissaba Palm, (*Attalea funifera*). A palm cultivated in the Botanic Gardens collection *Raffia Ruffia* furnishes a fibre which is woven into fabrics and plaited for delicate fancy work in the Mascarene Islands and used for bast in tying up vines.

Stem or Trunk.—Sago has already been mentioned as a palm product and the pith of the trunk of other palms also furnish sago but not in so large quantity or so good quality.

As timbers for inlaying and other fancy work palm wood is imported into Europe and America, Porcupine, Partridge, Coquerite, Palmyra, Carnauba are all well known palm timbers, and in all tropical countries palm wood has its uses.

In the Malay Peninsula Nibong, (*Oncosperma*), is an article of trade and is used when split for laths, rafters, flooring and railing, when split in two and hollowed is largely used on plantations and mines for guttering and for deviating and conducting water in lieu of piping.

Singapore is the head quarters of the rattan trade, the canes are obtained from the genera, *Calamus*, *Plectocomia*, *Korthalsia* and *Dæmonorops*, as described in a previous number of the Bulletin.

Walking sticks are obtained from palm timber and in some instances represent the entire stem as with the Pinang Lawyer, (*Licuala acutifida*) and *Kerintin* (*Ptychoraphis Singaporensis*).

Some species of palms are armed with spines, some pliable, others formidable, and have several domestic uses, and are used by the wild tribes of the Peninsula for darts and arrow heads.

Roots are occasionally used for domestic purposes as with the ærial roots of *Iriartea* by Indians on the Amazon and in many countries have native repute medicinally—as have also the fruits and juices of some palms, but most of them have been hardly scientifically examined.

LIST OF PALMS CULTIVATED IN THE BOTANIC GARDENS, SINGAPORE.

In this list the plants of which the names are printed in italics can be supplied either as seed or young plants.

ARECINEÆ.

Genus Areca—		
Areca Catechu, L. ...	"Betel-nut"	... Tropical Asia.
var. ...	"with yellow fruits"	
var. ...	"Pinang wangi" ...	
A. concinna, Thw. ...		... Ceylon.
A. glandiformis, Lam.		... Moluccas.
A. pumila, Bl.		... Java.
A. triandra, Roxb. ...		... India.
Genus Pinanga—		
P. disticha, Bl. ...	"Pinang Boring Padi"	... Malay Peninsula.
P. furfuraca, Bl. ...		... Celebes.
P. Kuhlii, Bl. ...		... Java.
P. timosa, Ridley ...		... Johore.
P. malaiana, Griff. ...	"Pinang Boring"	... Malay Peninsula.
P. paradoxa, Griff. ...		... Do.
P. patula, Bl. ...		... Sumatra.
P. riparia, Ridley ...		... Johore
P. subruminata, Becc....		... Malay Peninsula.
P. Veitchii, Hort. ...		... Borneo.
P. sp. ...		... Philippines.
Genus Nenga—		
N. wendlandiana, Scheff.	"Pinang Umu"	... Malay Peninsula.
N. macrocarpa, Becc....		... Do.
Genus Loxococcus—		
L. rupicola, Wendl. ...		... Ceylon.
Genus Actinorhytis—		
A. calapparia, Wendl....	"Pinang Sendawa"...	Malaya.
Genus Archontophœnix—		
A. Alexandræ, Wendl.	"Seaforthia elegans"	Queensland.
A. Cunninghamii, Wendl.		... Queensland and N. S. W.
Genus Dictyosperma—		
D. Album, Wendl. ...		... Mauritius.
D. rubrum, Wendl. ...		... Do.
Genus Ptychosperma—		
P. McArthuri, Wendl.		... Australia.
P. Sanderiana, Ridl. ...		... Polynesia.
P. sp. ...		...
P. Teysmanniana, Scheff.		... Java.

GENUS PTYCHOCOCCUS—
P. paradoxus, Becc. ... ... New Guinea.

GENUS COLEOSPADIX—
C. oninensis, Becc. ... ... New Guinea.

GENUS RHOPALOBLASTE—
R. hexandra, Bl. ... ... Java.

GENUS CYRTOSTACHYS—
C. Lakka, Becc. ... "Pinang Rajah" ... Malay Peninsula.
C. rendah, Bl. ... ... Sumatra.

GENUS CHRYSALIDOCARPUS—
C. lutescens, Wendl. ... ... Madagascar.

GENUS ONCOSPERMA—
O. tigillaria ... "Nibong" ... Malay Peninsula.
O. horrida, Scheff. ... "Bayas" ... Do.
O. fasciculata, Thw. ... ... Ceylon.

GENUS EUTERPE—
E. oleracea, Mart. ... "Mountain Cabbage Palm" ... West Indies.
E. stenophylla, Hort.... ...

GENUS PTYCHORAPHIS—
P. singaporensis, Becc. "Kerintin" ... Singapore.
P. angusta, Becc. ... ... Nicobars.

GENUS OENOCARPUS—
O. Bacaba, Mart. ... ... Brazil.

GENUS PRESTOEA—
P. montana, Hook. fil. ... Grenada.

GENUS OREODOXA—
O. oleracea, Mart. ... ... West Indies.
O. regia, H.B.K. ... "Royal Palm" ... Cuba.

GENUS CALYPTROCALYX—
C. spicatus, Bl. ... ... Amboina.

GENUS BACULARIA—
B. monostachya, F. Muell. ... Australia.

GENUS HOWEA—
H. Belmoreana, Becc. .. "Curley Palm" ... Lord Howe's Island.
H. Forsteriana, Bacc.... "Thatch-leaf Palm" Lord Howe's Island.

GENUS MALORTIEA—
M. fenestrata, Hort. ... ... Mexico.

GENUS HETEROSPATHA—
H. elata, Scheff. ... ... Amboina.

GENUS IGUANURA—
I. geonomæformis, Mart. ... Malay Peninsula.
I. ferruginea, Ridl. ... ... Do.
I. spectabilis, Ridl. ... "Teruno" ... Do.

I. Wallichiana ...		... Malay Peninsula.
I. bicornis ...		... Do.
Genus Stevensonia—		
S. grandifolia, Dunc....		... Seychelles.
Genus Verschaffeltia—		
V. splendida, Wendl....		... Seychelles.
Genus Dypsis—		
D. madagascariensis, Hort. ...		... Madagascar.
D. pinnatifrons, Mart.		... Do.
Genus Chamædorea—		
C. corallina, Hook. f. ...		... Venezuela.
C. elegantissima, Hort.		... Mexico.
C. Ernesti-Augusti, Wendl ...		... Colombia.
C. martiana, Wendl. ...		... Mexico.
C. Sartorii, Liebm. ...		... Do.
Genus Hyophorbe—		
H. amaricaulis, Mart.		... Mauritius.
H. Verschaffeltii, Wendl. ...		... Do.
Genus Exorrhiza—		
E. Wendlandiana, Becc.		... Fiji.
Genus Calyptrogyne—		
C. sarapiquensis, H. Wendl. ...		... Costa Rica.
Genus Geonoma—		
G. baculifera, Kunth. ...		... Guiana.
G. oxycarpa, Mart. ...		... Brazil.
Genus Bentinckia—		
B. nicobarica, Becc. ...		... Nicobars.
Genus Orania—		
O. macrocladus, Mart.	"Ibul"	... Malay Peninsula.
O. regalis, Miq. ...		... Moluccas.
Genus Manicaria—		
M. saccifera, Gaertn. ...	"Bussu Palm"	... C. America.
Genus Nipa—		
N. fruiticans, Thumb....	"Nipah"	... Eastern Tropics.
Genus Phytelephas—		
P. macrocarpa, R. & P.	"Ivory Nut Palm"	... Colombia.

CARYOTIDEÆ.

Gemus Wallichia—	
W. disticha, Anders. ...	... India.
Genus Didymosperma—	
D. Hookeriana, Becc....	... Malay Peninsula.

GENUS DIDYMOSPERMA.—*Continued.*			
D. hastata, Becc.	...	...	Malay Peninsula.
D. porphyrocarpon, Wendl.	...	...	Java.
GENUS ARENGA—			
A. Engleri, Becc.	...	...	Formosa.
A. saccharifera, Labill.	"Kabong Palm Sugar"	...	Malaya.
A. undulatifolia, Becc.		...	Borneo.
A. Westerhouti, Griff. ...	"Langkap"	...	Malay Peninsula.
A. Wightii, Griff.	...	...	India.
GENUS CARYOTA—			
C. urens, L.	... "Wine Palm Kitool"		India & Malaya.
C. Cumingii, Lodd.	...	...	Philippines.
C. mitis, Lour.	... (C. sobolifera) "Bredin"	...	Malay Peninsula.
C. propinqua, Bl.	...	...	Java.
C. Rumphiana, Mart. ...	(3,000 ft.)	...	Malaya.

PHŒNICEÆ.

GENUS PHŒNIX—			
P. acaulis, Buch.		...	India.
P. cycadifolia, Hort.		...	
P. dactylifera, *L.*	... "Date Palm"	...	N. Africa.
P. farinifera, Roxb.	...	...	India.
P. Hanceana, Becc.		...	China.
P. Roebelini, O'Brien.		...	Siam.
P. Paludosa, Roxb.	...	...	India.
P. Reclinata, Jacq.	...	...	East Africa.
P. rupicola, Anders.	...	...	India.
P. sylvestris	...	...	India.
P. zeylanica, Trimen. ...		...	Ceylon.
P. sp.	...	...	Guiana.

CORYPHEÆ.

GENUS CORYPHA—			
C. elata, Roxb.	...	...	India.
C. Gebanga, Bl.	... "Gebang Palm"	...	Borneo.
C. umbraculifera, L.	... "Talipot Palm"	...	India.
GENUS SABAL—			
S. acaulis	...	...	West Indies.
S. Adansoni, Guerns. ...		...	Southern United States.
S. Blackburniana, Glazebr.	...	...	Bermuda.
S. Ghiesbreghtii, Houtt.		...	
S. longipedunculata	...	...	
S. mauritiiforme, Griseb and Wendl.	...	}	Trinidad & Venezuela.
S. Palmetto, Lodd.	... "Cabbage Palmetto"		Southern United States.

GENUS SABAL.—*Continued.*

S. Princeps, Hort. ...		...
S. umbraculifera, Mart.		... Trinidad.
S. glaucescens, Lodd. ...		... Trinidad.

GENUS WASHINGTONIA—

W. filifera, Wendl. ...		... California.

GENUS TEYSMANNIA—

T. altifrons, Miq.	... "Daun Payong"	... Malay Peninsula.

GENUS CHAMÆROPS—

C. humilis, L. ...		... Europe.
var. tomentosa. ...		...

GENUS RHAPIDOPHYLLUM—

R. hystrix, Wendl.	... "Blue Palmetto"	... Florida.

GENUS NANNORHOPS—

N. Ritchieana, Wendl.		... India.

GENUS ACANTHORHIZA—

A. aculeata, Wendl. ...		... Mexico.

GENUS SERENOA—

S. serrulata, Hook. f.	... "Saw Palmetto"	... North America.

GENUS ERYTHEA—

E. armata, S. Wats. ...		... California.

GENUS COPERNICIA—

C. cerifera, Mart.	... "Carnauba Palm"	... Brazil.

GENUS PRITCHARDIA—

P. grandis, Seem. ...		... Polynesia.
P. sp. ...		... Trinidad.

GENUS LICUALA—

L. acutifida, Mart.	... "Pinang Lawyer"	... Penang.
L. ferruginea, Becc.	... "Palas"	... Singapore.
L. grandis, Wendl. ...		... New Hebrides.
L. Kingii, Becc. ...	Palas	... Perak.
L. horrida, Bl. ...	Do.	... Java.
L. orbiculata, Becc. ...	Do.	... Borneo.
L. peltata, Roxb. ...		... India.
L. Rumphii, Bl. ...		... Moluccas.
L. spinosa, Griff. ...	Palas	... Malay Peninsula.
L. triphylla, Griff. ...	Do.	... Do.

GENUS LIVISTONA—

L. altissima, Zoll. ...		... Java.
L. australis, Mart. ...		... Australia.
L. Chinensis, Br. ...		... China.
L. Cochin-Chinensis,	... "Serdang"	... Malaya.
L. Hoogendorpii, Teijsm. ...		... Java.
L. inermis, R. Br. ...		... Australia.
L. Jenkinsiana, Griff. ...		... Assam.
L. Mariæ, F. Muell. ...		... Australia.

GENUS LIVISTONA.—*Continued.*		
L. olivæformis, Mart. ...		... Java.
L. subglobosa, Mart. ...		... Java.
GENUS PHOLIDOCARPUS—		
P. Kingianus, Rid. ...	"Kepau" (Livistona Kingiana)	Malay Peninsula.
P. macrocarpa, Becc. ...		... Do.
GENUS TRACHYCARPUS—		
T. Martianus, Wendl....		... India.
GENUS RHAPIS—		
R. flabelliformis, L'Herit		... China.
var. variegata ...		...
R. humilis, Blume. ...		... Japan.
GENUS THRINAX—		
T. barbadensis, Lodd....		... Barbados.
T. Morrisii, Wendl. ...		... West Indies.
T. multiflora, Mart. ...		... San Domingo.
T. parviflora, Sw. ...		... West Indies.
LEPIDOCARYEÆ.		
GENUS DÆMONOROPS—		
D. angustifolius, Mart.		... Malay Peninsula.
D. calicarpus, Mart. ...	"Rotan Chuchur Minyak."	Do.
D. didymophyllus, Becc.		... Do.
D. geniculatus, Mart. ...	"Rotan Kerai"	... Do.
D. grandis, Mart. ...	"Rotan Sunang"	... Do.
D. hystrix, Mart. ...	"Rotan Buah"	... Do.
D. Jenkinsianus ...		... India.
D. longipes, Mart. ...	"Rotan Machap"	... Malay Peninsula.
D. periacanthus, Mart.		... Java.
D. Sp. ...		... Johore.
GENUS CALAMUS—		
C. aquatilis, Ridl. ...	"Rotan Ayer"	... Malay Peninsula.
C. cæsius, Bl ...	"Rotan Segar"	... Sumatra.
C. ciliaris, Bl. ...		... Java.
C. insignis, Griff. ...	"Rotan Batu"	... Malay Peninsula.
C. javensis, Bl. ...	"Rotan Lilin"	... Do.
var. purpurascens.		... Perak.
C. leptospadix, Griff. ...		... India.
C. Lindeni, Hort. ...		... Philippines.
C. Lobbianus, Becc. ...	"Rotan Manana"	... Singapore.
C. oxleyanus, Teysm....		... Do.
C. Ridleyanus, Becc. ...		... Do.
C. scipionum, Lour. ...	Rotan Semambu "Malacca Cane"	Malacca.
C. singaporensis, Becc.		... Do.
C. unifarius, Wendl. ...		... Java.
C. sp. ...	"Kukuwel"	... Ceylon.
C. sp. ...	"Rotan Segar"	... Palembang.

GENUS KORTHALSIA—		
K. echinometra, Becc.		... Singapore.
K. Junghuhnii, Miq. ...		... Java.
K. polystachya, Mart.		... Malay Peninsula.
K. scaphigera, Mart. ...	"Rotan Semut"	... Singapore.
K. Wallichiæfolia, Wendl.		... Do.
GENUS CERATOLOBUS—		
C. Kingianus, Becc. ...	"Rotan Kipas"	... Singapore.
GENUS MYRIALEPIS—		
M. Scortechinii, Becc.	"Rotan Gajah"	... Singapore.
GENUS PLECTOCOMIA—		
P. assamica, Griff. ...		... Assam.
P. elongata, Mart. ...	"Rotan Dahan"	... Malay Peninsula.
GENUS PLECTOCOMIOPSIS—		
P. sp. ...		... Singapore.
GENUS ZALACCA—		
Z. conferta, Griff.	"Kelubi"	... Malay Peninsula.
Z. edulis, Bl. ...	"Buah Salak"	... Java.
Z. Wallichiana, ...	"Kumbak"	... Malay Peninsula.
GENUS EUGEISSINIA—		
E. tristis, Griff. ...	"Bertam"	... Malay Peninsula.
GENUS SAGUS—		
S. lævis, Rumph. ...	"Sago"	... Malaya.
S. Rumphii, Willd. ...	Do.	... Do.

COCOINEÆ.

GENUS BACTRIS—		
B. acanthocarpa, Mart.		... Brazil.
B. major, Jacq. ...		... Mexico.
GENUS DESMONCUS—		
D. orthacanthos, Mart.		... Brazil.
GENUS ASTROCARYUM—		
A. mexicanum, Liebm.		... Mexico.
A. plicatum, Drude. ...		... Do.
A. tucumoides, Drude.		... South America.
GENUS MARTINEZIA—		
M. caryotæfolia, H. B. et K.		... Venezuela.
M. erosa, Lind. ...		... West Indies.
GENUS ELÆIS—		
E. Guineensis, Jacq. ...	"Oil Palm"	... Africa.
GENUS COCOS—		
C. amara, Jacq. ...		... West Indies.
C. coronata, Mart. ...		... Brazil.
C. campestris, Mart. ...		... Brazil.
C. flexuosa, Mart. ...		...
C. nucifera, L. ...	"Coco-nut"	... Tropics.
var. ...	"Kelapa Puyuh"	..

GENUS COCOS—*Continued.*			
C. plumosa, Lodd.	...		... Brazil.
C. Weddeliana, Wendl.			... Brazil.
C. sp.	...		... Mexico.
C. sp. nov.	...		... Guiana.
GENUS MAXIMILIANA—			
M. Martiana, Karst.	...		... Brazil.
M. regia, Mart.	...		... Brazil.
GENUS ATTALEA—			
A. cohune, Mart.	...	"Cohune Nut"	... Brazil.
GENUS JUBÆA—			
J. spectabilis, H. B. K.			... Chili.
GENUS ORBIGNYA—			
O. Sagotii, Mart.	...		... South America.
GENUS PSEUDOPHŒNIX—			
P. Sargenti	...		... Florida.
GENUS RAPHIA—			
R. Hookeri, Mann.	...		... Trop. Africa.
R. Ruffia, Mart.	...		... Madagascar.
R. vinifera, Beauw.	...		... West Africa.
GENUS EREMOSPATHA—			
E. macrocarpa, Mann.			... West Africa.
GENUS MAURITIA—			
M. flexuosa, Linn. fil.			... Brazil.

BORASSEÆ.

GENUS BORASSUS—			
B. flabelliformis, L.	...	"Palmyra"	... India & Africa.
GENUS LODOICEA—			
L. seychellarum, Labil.		"Coco de Mer"	... Seychelles.
GENUS LATANIA—			
L. aurea, Duncan.	...		... Rodriguez.
L. Commersonii, L.	...		... Mauritius.
L. Loddigesii, Mart.	...		... Do.
GENUS HYPHÆNE—			
H. guineensis, Schum.			... Africa.
H. thebaica, Gaertn.	...	"Doum Palm"	... Africa.

PARA RUBBER ESTATES NEAR MALACCA.

Free Press, June 22nd, 1904.

(BY A CORRESPONDENT.)

The enterprise and forethought of local planters, both European and Chinese, has probably never had a better and happier result than in the determination some five, six and seven years ago to commence rubber planting on a cultivated and scientific system.

The pluck and judgment then displayed has, it is very pleasing to note, proved what we all hope and anticipate will be a veritable "Goldmine" to those who had the capital, both in money and brains, to embark on what was at that time, a trial of patience in every sense of the word. Note—when I speak of "Gold-mine" I am not referring to the local article.

This last week-end I took a most interesting visit to an Estate which it appears to me must be one of the largest self-contained cultivated Rubber Plantations in the world. When I draw this comparison, your readers must understand that I am particularly referring to "cultivated" estates, *i.e.*, estates which have been planted simply for rubber, and cultivated up to maturity. There are doubtless both in the Congo and in South America vast tracts under the sway of any one man or corporation, but they are totally different to the estate under notice, they are merely vast extents of forest or jungle which contain large number of rubber trees, and moveover the trees are tapped as so much jungle produce, and are not cultivated, and looked after as are estates in the Straits.

The estate I visited partly on pleasure and partly on business, is the Bukit Asahan Estate, owned by a kongsi of Chinese, with a well known and respected Malacca Chinaman at the head, TAN CHAY Yan, of the well known family of "Tans."

The history of the estate, I found from the correspondence, was most interesting. About nine years ago TAN CHAY YAN had a private estate at Bukit Lintang, 6 miles out from Malacca, on which he grew coffee. Coffee was not giving all that was anticipated from it and Mr. CHAY YAN bethought himself of rubber, greatly, I am glad to say, owing to the initiative of the Government. Para and Rumbong rubber was therefore planted, and at the end of three years, it had shaped so well, that a larger scheme was embarked upon.

At this stage the interesting correspondence with Government began, TAN CHAY YAN on behalf of his Kongsi applied for 4,000 acres at Bukit Asahan, 33 miles out from Malacca, which was virgin jungle. Owing to his asking for permission to plant Tapioca as a "catch-crop" and also owing to his determination to plant the Rubber "15 by 15" (the Government demanding 10 by 10) TAN CHAY YAN looked very much as though he had no chance of obtaining the concession of the land. He therefore "cried off"

tentatively, but the Government came round, and granted him 3,000 acres of virgin jungle on very favorable terms, on the understanding that it was to be used solely for "Rubber" but giving him permission to take one crop of tapioca off the land and to plant 15 by 15 not 10 by 10. I do not think that Government can but be pleased at their bargain, for what was 6 years ago, dense jungle, is now a well planted, healthy, rubber estate, with over 520,000 Para and Rambong trees, ranging from 1½ years old to 5½ years.

Arriving at Malacca Sunday morning at 4 A.M. as usual, with a squall on, and the old tub "Malacca" rolling like a cockle-shell, we proceeded ashore, and after a welcome brush-up, started in fine style in CHAY YAN'S motor car for the older of the two estates, Bukit Lintang. This we went over, and thoroughly inspected the trees, buildings, and process of treatment of the latex.

Everything we came across was most encouraging, the trees were well grown, healthy, and clean. The ground was clear of all rubbish and growth, and the labour on the estate seemed thoroughly at home in their work.

We saw the latex being tapped from the trees. Malay women were on this job, and it was carried out by means of herring-bone shaped incisions in the bark of the tree from which the latex flowed and was collected in tin cans, in the form of a thick milky fluid. This latex is then treated with a little acetic acid, which coagulates the pure rubber, this is done in small China bowls, and the "biscuits" of rubber are in time taken from the bowl, rolled, and then hung up to dry, and in two or three months' time, a biscuit is obtained containing from 92 to 94 per cent. of pure rubber.

This Bukit Lintang estate has been, and is still, the experimental estate for Bukit Asahan, of 3,300 acres, which we went to see the next day, doing the 32 miles of road in good style in the motor, notwithstanding the lumpy state of same after the first ten miles. Bukit Asahan can truly be described as a fine sight. Standing near the proprietor's bungalow, one can see for acres around, nothing but undulating hills of healthy looking rubber trees, and the whole is made to appear to be one mass of green by reason of the tapioca which covers the estate as the catch-crop. Going through the estate we saw trees in every stage from 1½ years to 5½, and all were good-looking, the point which most strikes the lay mind being the rapid growth which the trees make after the 3rd year, the two years after the 3rd year putting on a much greater girth, than the first three years.

Tapioca has proved an excellent catch-crop, for it has given profits, although at the present low price it is unremunerative, but greater than this, it has prevented any secondary growth from giving trouble, and has kept in check that "bleeding" weed, lalang, which spoils the fertility of any land.

The rubber trees, principally Para, are planted 15 by 15 throughout the 3,300 acres. Altogether there are 520,000 trees, of which 80,000 could be tapped, but are prudently being left for another 18

months, to gain strength and girth, and the thorough mastery of the ground. 230,000 trees are over 3 years, and the remainder between 1½ and 3.

One is quite entitled to form the opinion that in years to come, when such estates as these are in full bearing, Ceylon and the Straits will become *the* market for rubbers of the best quality, for it is well known that the greater part of the rubber supply of the world is obtained from jungle collection, which is both impure and adulterated. The cultivated, clean rubber of the Straits should therefore find a ready and strong market of its own, and indeed the latest advice gives "Fine Para Biscuit" from Klang as having fetched 5/1½*d.* per lb.

A search for "pig" in the tapioca, and a run down to the seaside at Tanjong Bruas, where one again sees rubber in the garden there, made our visit most enjoyable. The piggies had not yet come out to feed, but the tiffin and lie-off at Bruas softened our hearts, and we returned fully expecting in 10 years time to see Malacca with rubber pathwalks.

This article however poor, cannot close without a eulogy for TAN CHAY YAN'S Kongsi, and a word of praise to Mr. W. EGERTON, late Resident Councillor, Malacca, who has always taken an interest in the estate, and encouraged the proprietors.

GUTTA PERCHA.

Kuala Lumpor,
27th June, 1904.

DEAR SIR,—With reference to Mr. SHERMANS' report mentioned in the Agricultural Bulletin for May, 1904, (page 168) on gutta percha in the Philippines, the concluding paragraph contains an assertion, which I think is entirely wrong. I doubt whether such large areas of young gutta percha trees can be found anywhere as in the Federated Malay States, and what is important, areas containing naturally grown plants only. In Perak we have an area of 270 acres and in Selangor 782 acres containing an average of 40 trees to an acre of all sizes up to 30 feet in height. In the former area undergrowth has been cleared and the young trees freed, in the latter young seedlings have been taken from adjacent forests and planted in lines 33 feet apart at 33 feet intervals in the line. Besides these areas there are still thousands of acres rich in Getah Taban *(Pal. oblongifolium)* much of which I have seen. The mention of Bukit Timah beside these areas seems almost absurd. In view of the above, the statement that the Dutch will have a monopoly of gutta percha in the future seems inaccurate. Unless I am greatly mistaken the Federated Malay States will be one of the chief producing countries. In our operations here we are merely assisting nature, we do not rely on plantations in the ordinary sense of the word, there being no necessity to do so, owing to the

magnificent and widely distributed crop of young Palaquium now existing in the forests.

This only requires reservation, improvement fellings and transplanting here and there, which can be done at small cost. The cost in 1904 was $4,234 for 1,052 acres and includes planting out about 20,000 young transplants in lines. In Negri Sembilan there are three known valuable areas, one of 1,536 acres in extent, and in Pahang extensive areas are known to contain the young plants in large quantities, but so far in this state we are only at the stage of commencing to choose our forest reserves. If the price of gutta percha in the future should be anything like what it was a few years ago, then the Federated Malay States may congratulate themselves on having a very valuable asset in its young gutta percha forests. Further particulars may be seen in paras. 44 to 48 of the Forest Administration Report, Federated Malay States, 1903.

Yours truly,

A. M. BURN-MURDOCH,

Conservator of Forest.

CASTLEWOOD,

Johore, 22nd June, 1904.

The Editor,

AGRICULTURAL BULLETIN.

DEAR SIR,—Will any of your readers be so kind as to tell me the proper way to tap and cure Gutta Rambong? I have 5 year old trees measuring 2 feet round the stems and with branches covering a circumference of 100 feet; but when tapped a single cut with a knife produces barely a thimbleful of latex; and even that is difficult to collect as it overflows the side instead of following the cut so that one cannot use the herring-bone method; and in fact a coolie can collect little more than enough to pay his day's wages.

To cure it, I poured the latex into a pot of hot water on the fire and when it boiled and formed on the top of the water, I took it out and pressed it into biscuits. I have shipped to London on two occasions (about 20 lbs. each time) and it has sold at 4/4*d.* per lb. and 5/- per lb. against 4/6*d.* and 5/1*d.* In No. 1 Para biscuit sent with it; so perhaps this simple method of curing may be as effective as any other—but there surely must be some more economical way of tapping and collecting?

I have, etc.,

M. LARKEN.

SELANGOR STATE MUSEUM,
Kuala Lumpor, May 31st, 1904.

To the Editor
AGRICULTURAL BULLETIN.

DEAR SIR,—In the "Agricultural Bulletin" for January of the current year, I observe a note by Mr. R. PEARS on the damage caused to Para Rubber by a beetle identified as *Astychus chrysochloris.*

The species, which I have found widely distributed in the Peninsula both in cultivated land and in high jungle was first brought to my notice as an agricultural pest by Mr. S. ARDEN, Superintendent, Experimental Plantations, Selangor.

On May 3rd, 1902, Mr. ARDEN wrote from Batu Tiga to the following effect—"So far the damage is limited to one or two trees from which most of the young leaves have been eaten, the trees having much the same appearance as though they had been attacked by caterpillars. I caught between 20 and 30 specimens on one tree and as there are coffee and bananas close by unaffected, this seems to show that this particular tree is to their liking."

A few days later I found several trees affected on the Sungei Rengam estate and specimens collected on that occasion were identified by Mr. F. V. THEOBALD of the British Museum as the widely spread weevil, *Eumeces squamosus*, Fabr.

The insect is only injurious in its adult state, when it is a voracious feeder on young leaves, while the grubs feed on decaying leaves and other vegetable matter and may often be found at the foot of the affected plants.

In destroying the pest, advantage may be taken of the well known habit of the family of shamming death on the slightest alarm.

In medium sized trees a vigorous tapp'ng of the trunk will cause the majority of the insects to fall to the ground and remain still when they may be taken up and burnt. In the case of larger tree the branches may be agitated by the use of a long bamboo.

It is especially important that vigorous steps should be taken on the first appearance of the insect as its power of increase are very great while the great destruction of leaf caused by a comparatively small number may seriously check the development of the trees even if they are not actually killed.

I am, etc.,

HERBERT C. ROBINSON,

Curator, Selangor State Museum.

GOLDEN HOPE ESTATE,
Klang, 8th July, 1904.

To the Editor,

AGRICULTURAL BULLETIN, SINGAPORE.

DEAR SIR,—In case any of your readers are still interested in any way in the now-a-days much despised cultivation of Liberian Coffee, either as a catch crop or otherwise, I am sending you a few particulars of results of a year's working on this estate up to the end of last month.

The acreage actually planted with Liberian Coffee is 300 acres. This was planted originally 10′ × 10′.

The total amount of rice coffee shipped (representing the cherry picked during the 12 months in question) was 2,404 piculs or more than an average of 8 piculs per acre over the whole estate.

One clearing of 27 acres gave over 13 piculs per acre, another of 10 acres gave 11.20 piculs per acre, and a third of 30 acres gave over 10 piculs per acre.

The average age of the coffee is 8 years. The clearing that gave 13 piculs per acre will be 8 years old in August next.

No manure or dressing of any sort has ever been put into the soil, neither has the soil been dug over.

This is the second year in succession that an average of more than 8 piculs of rice coffee per acre over the whole estate has been obtained and it looks more than probable that the current year's working will show as good results. Of course the soil is rich alluvial soil.

I have, etc.,
EDMUND B. PRIOR.

NEW PUBLICATIONS ON RUBBER.

Mr. STANLEY ARDEN'S well known Pamphlet on Hevea Brasiliensis has been translated into French by Mr. CIBOT, with annotations by the translator and the additions of several plates taken from M. CALLET'S work on Para Rubber.

Mr. WILDEMAN, the Conservator of the Botanic Gardens, Brussels, is publishing a work on the Laticiferous Leaves of the Congo, well illustrated by coloured plates of Landolphias and Carpodini.

RUBBER PRICES AND OTHER NOTES.

Quite an extensive correspondence has been carried on about the present high prices of rubber and its probable fall, some of which we reprint here. I do not suppose that any planter expects the extraordinarily high prices of the best Para biscuits to keep up. Every

product has periods of fluctuation, and there is a larger demand for cheap products of this class than for dear ones. The future history of prices has been compared with the past history of cinchona and other products, which produces more misconception than anything else. Cinchona, for instance, is only used practically for one purpose, *i.e.*, one ailment, consequently its sale depends on that ailment, and it can easily be overproduced. Perhaps it is correct to say that rubber has more trade-uses than any other cultivated plant. This alone puts it on a safer basis than almost any other plant to the cultivator.

But surely no one expects that in future all rubber we produce in any quantity is going to keep up at 5*s*/3*d*. per lb. The amount that will we hope be shortly produced in the Peninsula alone will be enormous and who is going to supply the cheap rubber? When 12 or 13 years ago I was urging the planting of Para rubber by planters in the Peninsula, the returns of fully bearing trees were estimated at 2 lbs. each per year, and the price of the product at 2*s*. per lb. It was shown then that on this very low estimate, the cultivation would pay well. Prices of labour and other things have risen since then, but even allowing for all this there does not seem to be any fear of a sufficiently bad permanent fall to make the cultivation unprofitable.

Mr. STEPHENS has shown (Bulletin No. 5, p. 171) how very cheaply and with what simple apparatus the product can be prepared, and I have no doubt that when the price falls low we shall have found out many ways of reducing the cost of production.

A somewhat feeble criticism on Mr. CAREY'S account of Mr. STEPHENS' estate appears in the *Colombo Observer*, May 27th. It is not worth reprinting. The only noticeable points are that the author thinks that the farrier's knife used to make the cuts must endanger the tree. From work in the Botanic Gardens we have found that as a matter of fact the knife (an ordinary pruning knife is used, but I doubt not a farrier's knife would do as well) is the most satisfactory instrument to use, and is in many ways superior to at least some of the tapping tools invented.

The author finishes up with suggesting that Mr. STEPHENS would do better to take a lesson from certain Ceylon estates and put up a properly equipped factory, etc., which is very amusing and shows that he has missed the whole point of the article which is to show how cheaply rubber of first class quality can be made and also like most of the good people of Ceylon that he is utterly ignorant of the progress which the planters here have made in the cultivation and preparation of rubber or that they are at least as well up to date as those of Ceylon.

Acetic Acid in Rubber.—A note appeared in the Pharmaceutical Journal some time ago, in which the author thereof speaking of Ceylon rubber stated that that was superior as it was prepared without the use of acetic acid, while that of the Straits was inferior on that account. As this was reproduced in several Journals, it is

perhaps worth while to criticise it, and to point out that it is just as easy though a little slower to prepare the rubber without as with acid, that it is mere guess-work to state that the rubber is deteriorated by the use of acetic acid in coagulation as no manufacturer has yet raised any objection to it and that the acidised rubber of the Straits has fetched higher prices than the non-acidised rubber of Ceylon.

It may be pointed out that acetic acid evaporates more rapidly than water, and consequently in drying goes off the rubber as readily as the water does.

It is regrettable that writers often publish pure guess-work as solid facts so often. Most misleading and too credulously accepted statements are thus published in all kinds of papers. No facts have yet come to light to suggest that the use of small quantities of acetic acid are injurious to the rubber, and when they do, we can do without its use.—*Editor*.

From the "Times of Ceylon."
Monday, June 6th, 1904.

EDITORIAL.

RUBBER MAY FALL TO *2s. 6d.* A LB.

The *India Rubber World*, a purely trade journal representing the "Caoutchouc, Gutta percha, Asbestos and allied industries," to quote from its title page, takes this paper to task for expressing surprise at the fluctuations shown in the prices of fine Para rubber kindly supplied us in tabular form by Mr. F. M, WOLFF, of Hamburg, and published by us as a supplement on Friday, 15th April last. The article referred to is reproduced in full in another column, so that our readers can see for themselves what this trade paper says. We are told many things certainly new to us, and we venture to think new to a good many others. We learn that the fluctuations in the price of rubber are "often over a shilling" a lb. that no one could possibly "conceive of them as stable" which is rather a disconcerting statement. Then we are told that stock has nothing to do with the price of Para rubber—"to say that the stock in the United Kingdom determines the price is to put the cart before the horse" says this trade oracle. Well, we have lived under this unfortunate delusion for many years until our eyes have been opened by this India rubber paper. We have always thought that the stock of an article *in first hands*—which were the figures given by us—had a good deal to do with the price. It seems we were wrong. It is the price which determines the stock; but we will not labour the point. We refer our readers to the article itself, which contains one interesting paragraph from a producer's point of view, namely, that dealing with over-production. Figures are

given showing the total quantity of rubber exported from Para for 16 years past, from which we learn that in 1901, the last year for which statistics are given 30,000 tons were exported from Para, of which 12,000 tons went to the United Kingdom. On this the *India Rubber Journal* exclaims :—

"How completely these figures show the folly of thinking that the addition of cultivated rubber will even in the distant future tend to over production is obvious when is taken into account how many acres of rubber trees are necessary for the production per annum of one ton of rubber."

Well at 190 trees to the acre—a common distance—and at 2lbs. per tree it would take about 7 acres to produce one ton of rubber. We, therefore, cling to our folly and fully and firmly believe that cultivated rubber, when it comes on the market in large quantities is bound to effect the price of the product in the markets of the world. No doubt it would suit the rubber trade if tons, and tons, and tons of rubber were sent to market, but the producer has been "nipped" by low prices too often not to make him a little cautious in such a matter. And if what we have said has tended to prevent rashness, we are quite satisfied.

FLUCTUATIONS IN THE PRICE OF RUBBER.

"*Times of Ceylon*" *Comments Criticized.*

The following criticism of our comments on the interesting table of rubber prices and other information supplied to us by Mr. F. M. WOLFF, of Hamburg, appears in the *India Rubber Journal* to hand by this mail :—

The position of the press in connection with the planting of rubber is one of considerable difficulty, I have no doubt, but one or two items which have been sent to me by members call for some comment. In a Bulletin of this nature much can be said which would be altogether out of place in the public press—that is, the future of the industry can be discussed without incurring the danger of the casual reader gaining an altogether wrong impression of the *reason* for the discussion. It is altogether a different matter when a paper of standing and credited with some knowledge of the rubber industry publishes the remarkable paragraph which we give underneath, and which evidently has struck them with dismay. I have been asked by several planters who have been alarmed by the paragraph to refer to the matter and give whatever explanations are possible. It will be better to give the paragraph first, as it appears in the *Times of Ceylon.*

European prices for Para Rubber.—We are in receipt of a most interesting communication from Mr. F. M. WOLFF, of Hamburg, who, when in Ceylon, supplied us with much valuable information on rubber and rubber prices. He also forwards us a table showing

the stocks and fluctuations of prices in rubber, compiled from official statistics for the last 20 years, and we must say the figures rather stagger us. If these figures are to be believed, the market of rubber is liable to strong fluctuations and seems very sensitive to over-supply. Are stocks in Liverpool and London high, then down goes the price 1*s*. or more a lb.; are stocks low, then the figures mount up rapidly. Now this is not quite the story which we have been led to believe. We have been told that prices of fine Para are no doubt high, but we have looked on them as stable and not liable to great fluctuations. In January, 1900, the price of fine Para was 4*s*. 9*d*. a lb.; in February, 1901, it fell to 3*s*. 6*d*.; and in February, 1902, to 2*s*. 11*d*. Since then it has been on the rise, and touched its highest point in September, 1903, when it was 4*s*. 8*d*. These prices are evidently the result of the statistical position. Here are the prices we have quoted—extremes in all cases—with the stocks of *fine Para* at the same date:—

		Price per lb.	Stocks in U. K.
January,	1900 ...	4*s*. 9*d*. ...	449 tons.
February,	1901 ...	3*s*. 6*d*. ...	1,346 ,,
February,	1902 ...	2*s*. 11*d*. ...	1,602 ,,
September,	1903 ...	4*s*. 8*d*. ...	242 ,,

Of course, these are the prices and the stocks of *fine* Para rubber only, in the United Kingdom, but they don't seem to support the idea that any quantity of fine Para rubber can be absorbed by the markets of the world, for directly the stock in the United Kingdom goes up 1,000 tons, down goes the price from 4*s*. 9*d*. to 2*s*. 11*d*.

The point objected to.—The point that I take objection to in the paragraph is not the wrong reasoning, which is obvious, but the remark in the fifteenth line. "Now this is not quite the story we have been led to believe. We have been told that prices of fine Para are no doubt high, but we have looked upon them as stable and not liable to great fluctuations." Any reader taking note of that would conclude at once that "another bubble had been burst," that wrong statements had been made by someone interested, that rubber cultivation was "a frost," and that, finally, he would take good care not to invest in it. This is not an overdrawn picture, but practically what happened in the case of a man who had taken up the study of rubber planting with the intention of investing in it. What are the true facts of the case? The prices of rubber are given week by week and often day by day in many papers. We ourselves publish a chart fortnightly showing the prices for the five years previously. No secret has ever been made of the price, and not a year has passed, during the last forty years, but what the variations in the price of fine Para have exceeded sixpence a pound and have very often been a shilling and over. How anyone with even an elementary knowledge could conceive them as stable is beyond our belief.

A table of prices.—Lest others might be led into a similar error, we give on another page in this issue a table of prices of fine Para

for the last forty-two years. From this they can see that, notwithstanding fluctuations, the average price per year has, with exceptions, shown an upward tendency. This is a copyright table, but, on application, I will be glad to give permission to any paper to publish it.

The lack of logic shown in the reasoning that the price depends upon the stock in the United Kingdom is obvious. It is easy to select certain months in certain years to secure proof of any argument one likes to advance. Still, even taking the months and prices given, the absurdity of the reasoning is clear. The visible supply of Para rubber—that is stock in Britain, Europe, America and at Para and afloat, in January, 1900—was 4,508 tons, and the price was 4*s*. 9*d*. In September, 1903, it was 1,817 tons, and the price was 4*s*. 8*d*. To say that the stock in the United Kingdom determines the price is to put the cart before the horse.

Some real reasons for fluctuations may be given. The rubber market is more or less in the hands of the importers—firms of considerable capital and experience. They have their own risks to take, doubtless, but so strong is their position that only natural laws prevent them from attaining a complete ascendency. Their constant effort is to keep the price of crude rubber as high as possible, and to effect their purpose they arrange matters so that every possible advantage is taken of existing opportunities. The methods adopted are too intricate to go into here (even if the writer fully knew them all) but the result is well enough known. When the manufacture *must* have rubber the price goes up. That may be a coincidence! Short harvests, bad seasons, high mortality amongst the natives are all urged at times as a reason why there must be a scarcity of rubber, but the real determining factor is the demand of the manufacturer. The supply and demand are so very close that even a slight brisk trade on the manufacturing side will make an appreciable difference.

Stocks "and" Stocks.—Then, again, there are different sorts of stocks. There are stocks of rubber not yet sold to the manufacturer, and there is the stock which he himself holds. Last year, to my own knowledge, one firm in America bought within a week 200,000 dollars worth of rubber—and there have been bigger purchases than that made. When rubber is high in price the manufacturer buys as little as possible—naturally. It therefore depends upon how much stock the manufacturer has, and how brisk the trade is, as to the length of time that the price will keep up. The stocks that our contemporary speaks of follow the price of rubber, and not the price following the stocks. I trust that I have made the position clearer. The table referred to is a very important one for members to preserve, as it clearly proves that, notwithstanding the increased supply, the price of rubber is, on the average, going up slowly but steadily.

Over-production, etc. is also another theme on which much ink has been shed. In order to give members matter with which to settle this argument, I have collected the figures for 14 years show-

ing the total export from Para of rubber, and how much of it comes to England.

—	*1887.*	*1888.*	*1889.*	*1890.*	*1891.*	
From Para	15,600	15,900	15,500	16,900	18,400	tons.
To England	4,400	5,080	5,920	5,600	6,000	,,
—	*1892.*	*1893.*	*1894.*	*1895.*	*1896.*	
From Para	18,920	19,730	19,500	20,710	21,600	tons.
To England	5,960	6,700	6,810	7,285	9,350	,,
—	*1897.*	*1898.*	*1899.*	*1900.*	*1901.*	
From Para	27,700	22,000	25,300	26,876	30,300	tons.
To England	7,865	9,500	7,430	10,445	12,100	,,

How completely these figures show the folly of thinking that the addition of cultivated rubber will, even in the distant future, tend to over-production is obvious, when it is taken into account how many acres of rubber trees are necessary for the production per annum of one ton of rubber.

Lastly, every rubber planter I have met has never imagined that the high price of rubber will continue. He hopes it may, naturally, but nearly all calculations as to revenue in the future are made.

On the basis of 2s. 6d. per pound.—Should rubber ever fall to this price, there would be so great a demand for it for goods which are now manufactured of some other material that a reaction would soon take place. Then, just a word about another point which has been raised in the public press, namely, the statement that the latex of the Castelloa will not coagulate. This has been made much of, yet the absurdity is very apparent. Some man has tried a wrong process with unsuccessful results, and rushes into print, with the result that doubt is thrown upon the advisability of planting a very useful rubber. All these things do harm to an industry still in its infancy, because they are quoted from paper to paper, and check the public from investing money in one of the most promising industries of modern times. If half the money invested in gold mines had been sunk in rubber plantations, how much richer Britain would be at the present time!

INTERESTING INTERVIEW WITH MR. FRANCIS J. HOLLOWAY.

His Views on Rubber, &c.

Interviews in London.

Mr. Holloway, having a letter of introduction to the Editor of the *India Rubber World*, took the first opportunity of calling on him, and was surprised to find the great interest taken by the editor in all matters concerning the cultivation and preparation of rubber,

and also at the great amount of practical knowledge he possessed on the subject. Mr. HOLLOWAY says it was almost equal to actual experience.

Having seen some of the leading rubber people, he found they were all of the opinion that rubber has come to stay, and that there need be no fear of overproduction, in years to come, if at all. He says that the uses to which rubber would be put, in the event of greater production would be legion, which fact alone would always help to keep up a certain price. He thinks that too much importance has been attached by some rubber growers to the table prepared and printed in the *Times of Ceylon* tending to prove that the greater the quantity, the poorer the price. Mr. HOLLOWAY read the following from the table in question:—

Stocks in London

					s.	d.
Jan.	1900	449	tons	price	4	9
Feb.	1901	1,346	,,	,,	3	6
Feb.	1902	1,602	,,	,,	2	11
Sept.	1903	249	,,	,,	4	8

"The reasoning in the above table,' says Mr. HOLLOWAY, "does not at all coincide with the impression formed in London, and the editor of the *India Rubber World* is especially annoyed that this impression should be formed as it would damage the rubber trade to a certain degree by frightening would-be investors that do not know sufficient of the trade, but place a certain amount of confidence in such reports. The facts are that the above figures do not represent the actual stock of rubber, but only the *Manufacturers' Stocks*—this should be remembered—and it stands to reason, that the manufacturer would buy less, in January, 1900, at 4*s.* 9*d.*, and much more in 1902 at 2*s.* 11*d.*"

"And to bear out that this reasoning is right, you must take the actual stock of rubber on the market, on sea, &c., as near as possible. The visible supply of rubber that is stock in Britain, Europe America, Para, and afloat in January, 1900, was 4,500 tons, prices 4*s.* 9*d*; in September, 1903, 1,817 tons and price, 4*s.* 8*d.* To say that the stock in the United Kingdom determines the price, is to put the cart before the horse."

The price is bound to fall.—"And now as regards our Ceylon rubber, the high prices here realised are due to the reason that almost all the present supply (which is small from Ceylon) is entirely used by manufacturers for high class solutions only, and that when larger quantities of it are sent the price is bound to fall to a certain extent, for the reason that our rubber lacks "nerve" owing to our present mode of preparation leaving an undue amount of albumen, &c. The idea at present is that this can be remedied to a certain extent by the rubber, immediately after coagulation, being put through a masticating machine *on the estate* while it is quite soft, thus saving a great amount of pressure and power, as the machines would masticate it easier being soft than if it were done at home by the manufacturers, after it had thoroughly dried

and hardened as at present. The idea is that this masticating while soft dispels the albumen and restores the elasticity or nerve."

"Secondly, that vacuum driers should be used, as it would greatly reduce the space required for drying the rubber, also time required for drying the rubber. A vacuum drier is supposed to dry the rubber thoroughly in three hours—after it has passed through the masticating and rolling machines. I believe that machines are now being made in Germany for masticating, and drying the rubber, and that the combined cost of both machines would be about £80 only, to those estates already having steam power."

In his several interviews with the editor of the *India Rubber World*, Mr. HOLLOWAY saw samples of rubber from all parts of the world in every shape and form, rubber from the Straits being nearest in shape, colour, and tenacity to our Ceylon rubber.

"Ceylon men will have to look smart, as the Straits men are very keen indeed in rubber, and are also evincing the keenest interest. I met two of them myself in London, who were home for a holiday."

Para Oil.—Another subject, which, said Mr. HOLLOWAY, seems to interest those concerned in rubber growing, is to utilize the Para seed for oil, &c. This being quite a new idea, he had not made any experiment, but would do so with some of this years' crop.

"A query put by the editor, *India Rubber World* was: What was the amount of seed produced by a single tree? The figures given by Mr. RUTHERFORD were, I believe, 400 seeds, but I would give 2,500 as nearer the mark, judging by the seed sold and put in nurseries, last year, off Kepitigalla estate."

THE FUTURE OF RUBBER.

SIR,—Surely a careful reading of the extract you give from the *India Rubber Journal* will show what incorrect deductions you have drawn from it in your leading article headed "Rubber may fall to *2s./6d.* a pound" in yesterday's issue.

It seems to me abundantly clear "that the intention of the writer was to show that supply and demand are so very close" that the factor of stock may be entirely eliminated from any consideration of prospects and prices, and that the sole cause of the fluctuations to which you drew attention may be found in the immediate demand of the manufacturers who can pay the prices asked. In other words the present price of rubber is an artificial one for the reason that there is not enough of it excepting for special purposes which are able to bear the burden of the high rates. Under such conditions is it any wonder that prices fluctuate to the extent they do?

What is of interest is to learn that the *average price* per year has, as a rule, shown an upward tendency—here we have proof of

the general stability of the trade which even the high prices, combined with increased supply, cannot check.

I see, Mr. Editor, you are foreshadowing the policy of "starve the rubber market." As a small investor in rubber cultivation I do not regret the large extensions that are being made in all quarters of the globe which forecast in the not distant future a much more healthy tone of trade when prices will fall to a level which will enable rubber to be used for the many purposes the present inflated prices prohibit, and when all of us from producer to consumer will participate in a well paying industry with vast possibilities of development, for who is to say where the demand for fair-priced rubber is to end. We do not grudge the few lucky ones their present large profits to last for ever.

Yours, etc.,

W. E. G.

Colombo, June 7th.

[NOTE BY ED. *Times of Ceylon.*—We trust our correspondent is right, only exactly the same argument was used in the early days of the cinchona era. Let prices fall to a low level, and demand will at once force them up again. But the price fell and the anticipated demand never came. With rubber this will no doubt be different. It can be put to so many valuable purposes, and demand for it is certain to increase. We fully believe that. But we inculcate caution that is all. Also we do not quite understand how in any market stocks are the result of prices as alleged by the paper referred to.]

RUBBER PROSPECTS.

LONDON BROKERS' OPINION.

Messrs. LEWIS and PEAT, brokers of London, write thus on rubber prospects to the *Straits Echo* under date 26th May:—

We must point out to planters that to-day's prices are "famine prices" and cannot possibly be maintained when rubber becomes more plentiful as it is bound to do, and as the price of Ceylon or Straits-grown Para is regulated entirely by the price of "Fine Para" from the Amazon and Islands, the following reminder may be useful:—

Fine Para to-day is 4/10½*d.* per lb., Ceylon 5/2*d.*
,, May, 1903, 3/10½*d.* ,, ,, 4/3*d.*
,, ,, 1902, 3/- ,, ,, nil.
and at one time in 1902, 2/10½*d.* per lb.

So that prices to-day are about 2/- per lb. more than they were 2 years ago and are about 1/6*d.* per lb. over the average. From these figures you will see how dangerous it would be to base any calculations upon present prices, although owing to the extraordi-

nary demand and scarcity we see no prospect of any very serious decline at present.

We should rather indicate as likely a price in the future of about 3/0*d.* per lb. than anything approaching 5/6½*d.* at which a few cases Straits-grown Para sold at our last auctions against 5/2*d.* for Ceylon grown; but for the next few months we think something near present rates will be maintained, as any large arrivals from the Amazon cannot reach Europe for some months. The last crop of Para, Peruvian, Bolivian, etc., amounted to 31,000 tons and this crop will be about the same.

Your readers will therefore readily understand of what magnitude and importance the variation of the price of this article is when measured by such differences as 1*s.* or 2*s.* per lb. on such quantities as the Para figures run into, to say nothing of African, Congo and other sorts which bring the world's production up to about 60,000 tons annually.

The remarkable feature of this important article is, that although the production has increased by leaps and bounds the consumption has outstripped the production and resulted during the past two years in a large deficit, and an enormous rise in values which amount to about 65 per cent.

It is only reasonable to expect a set back after such an advance and planters should not base their calculations for the future on anything over 3*s.* a lb. when the production of Para has caught up the consumption as it is bound to do.

SCALE ON PARA RUBBER.

While examining some young para rubber trees in Johore, about 2 or 3 years old, I observed that the leaves were short wrinkled and generally unhealthy looking and the plants seemed generally speaking to have been retarded in their growth. This seemed to have been caused by the attacks of a black Coccid, or scale insect. The insect full grown is about ⅛ inch long ovoid in outline, with the edges minutely ciliate, and shortly conical, dull black in color. Being adult females they had large numbers of minute whitish yellow young ones under the dry carapace; younger females were more of a brown color, rather longer and more elliptic in outline with very short white legs. The insect seemed to be leaving the trees and dying out as many trees which had been affected were recovering and no scale was to be seen on them. It would be easy to check this pest in young trees by rubbing it off by hand and it need never be allowed to become serious. Still it should be watched and not allowed to spread.—Ed.

BISULPHIDE OF CARBON FOR TERMITES.

Termites ("White Ants"). In my report for 1901 mention was made of some experiments in the use of Bisulphide of Carbon

as an experiment of "white ants" (Termites). These experiments were necessarily limited by reason of the extraordinary difficulty in obtaining the chemical. Having been able to procure from India a larger supply of the Bisulphide, I have considerably extended these experiments, with the result that I am still more fully convinced of the great value of this treatment. A definite area of the Gardens was marked out for experiment, and every ant's nest within this area was treated, apparently with complete success. Bisulphide of Carbon gives off a very poisonous gas, which, being heavier than air, sinks to the bottom of the cavities and penetrates the subterranean galleries of the termites killing every insect with which it comes in contact. All that is necessary is to pour a small quantity of the liquid into the main shafts of the nests and close the apertures with earth. The inhabitants of the nest are killed *in situ*, and the mounds may be levelled and otherwise left untouched. The difficulty in obtaining the chemical is due to its highly inflammable nature, and results in the imported article being very costly. But, given a sufficient demand, it could be manufactured locally, as it now is in India, and sold at a rate which would allow of its being extensively employed.—*Ceylon Administration Report, 1902.*

[Carbon bisulphide has long been known and largely used for dealing with underground pests, and is one of the "secrets" used by game-keepers at home for making rabbits leave their burrows and lie out. It has not been recommended in the Bulletin previously for termites on account of its being almost impossible to get it in sufficient quantity in the Straits and from its very dangerous nature. From the recklessness of the coolies in handling dangerously inflammable substances, it is hardly safe to allow them the use of it.]

COTTON LEAF-ROLLER.

The cotton leaf-rolling caterpillar which has been so troublesome in the Egyptian cotton grown in the Botanic Gardens, Singapore, and has been described in Bulletin III, p. 161, has been identified by Mr. C. O. WATERHOUSE of the British Museum as *Syllapta derogata*, Fabr, one of the *Pyralidæ* and an insect of very wide distribution.—*Editor.*

MISCELLANEOUS.

Notices to Subscribers.

I. For the information of subscribers and others who have been unable to complete their series of the Agricultural Bulletin of the Straits and Federated Malay States notice is here given that Nos. 1, 7, 8, 9, of the Old Series (1891–1900) and Nos. 1, 8, 9, 10, of the New Series Vol. 1 (1901–1902), the first issues of which have long been exhausted, are now being reprinted, with plates, and will shortly be ready.

II. Subscribers whose subscriptions are still unpaid are requested to send in their subscriptions for the present year as soon as possible. Members of the United Planters Association are requested to send in their subscriptions in future directly to the Editor and not to the Secretary of the Association.

II. Subscribers outside the Peninsula will in future be charged $3.50 per annum instead of $3 in order to cover postage.

Meteorological Observers are asked to send in their returns to the Editor, to arrive before the 10th day of the following month if possible, so as to be in time for going to press.

SINGAPORE MARKET REPORT.

July, 1904.

Articles.	Quantity sold.	Highest price.	Lowest price.
	Tons.	$	$
Coffee—Palembang	...	26.00	25.00
Bali	...	22.50	22.00
Liberian	166	21.50	20.00
Copra	3,763	8.90	8.25
Gambier	1,815	9.25	7.75
Cube Gambier, Nos. 1 and 2	192	13.75	11.00
Gutta Percha, 1st quality	...	200.00	150.00
Medium	...	100.00	90.00
Lower	...	80.00	12.00
Borneo Rubber 1, 2, and 3	...	140.00	80.00
Gutta Jelutong	...	9.60	8.60
Nutmegs, No. 110's	...	40.00	39.00
No. 80's	...	70.00	61.00
Mace, Banda	...	110.00	100.00
Amboyna	...	85.00	80.00
Pepper, Black	378	26.50	24.25
White (Sarawak)	355	38.50	34.50
Pearl Sago, Small	150	4.00	3.90
Medium	35	...	...
Large	30	...	...
Sago Flour, No. 1	4,630	3.20	2.90
No. 2	620	1.20	1.05
Flake Tapioca, Small	366	4.10	3.95
Medium	45	...	...
Pearl Tapioca, Small	411	4.20	3.95
Medium	498	4.20	3.95
Bullet	10	5.10	4.75
Tin	2,051	74.00	69.75

Export Telegram to Europe and America

For Fortnight ending 15th June, 1904.

Wired at 1.40 p. m. on 16th June, 1904.

					Tons.
10	Tin	Str.	Singapore & Penang	United Kingdom &/or	1,350
11	Do.	,,	Do.	U. S. A.	405
12	Do.	,,	Do.	Continent	412
13	Gambier	,,	Singapore	London	...
14	Do.	,,	Do.	Liverpool	280
15	Do.	,,	Do.	U. K. &/or Continent	60
16	Cube Gambier	,,	Do.	United Kingdom	40
17	Black Pepper	,,	Do.	Do.	40
18	Do.	,,	Penang	Do.	50
19	White Pepper	,,	Singapore	Do.	20
20	Do.	,,	Penang	Do.	30
21	Pearl Sago	,,	Singapore	Do.	30
22	Sago flour	,,	Do.	London	450
23	Do.	,,	Do.	Liverpool	1,075
24	Tapioca, Flake	,,	Singapore & Penang	United Kingdom	290
25	Do. Pearl	,,	Do.	Do.	310
26	Do. Flour	,,	Penang	Do.	950
27	Gutta Percha	,,	Singapore	Do.	...
28	Copra	,,	Singapore & Penang	Do.	...
29	Buffalo Hides	,,	Singapore	Do.	100
30	Pineapples	,,	Do.	Do.	cases 30,000
31	Gambier	,,	Singapore	U. S. A	430
32	Cube Gambier	,,	Do.	Do.	30
33	Black Pepper	,,	Do.	Do.	80
34	White Pepper	,,	Do.	Do.	20
35	Black Pepper	,,	Penang	Do.	80
36	White Pepper	,,	Do.	Do.	...
37	Nutmegs	,,	Singapore & Penang	Do.	2
38	Flake & Pearl	,,	Do.	Do.	190
39	Pineapples	,,	Singapore	Do.	cases 1,500
40	Do.	,,	Do.	Continent	cases 2,200
41	Gambier	,,	Do.	S. Continent	270
42	Do.	,,	Do.	N. Continent	60
43	Cube Gambier	,,	Do	Continent	60
44	Tapioca Flake	,,	Singapore & Penang	Do.	120
45	Do. Pearl	,,	Do.	Do.	150
46	Copra	,,	Do.	Marseilles	940
47	Do.	,,	Do.	Odessa	...
48	Do.	,,	Do.	S. Continent	200
49	Do.	,,	Do.	N. Continent	100
50	Black Pepper	,,	Singapore	S. Continent	150
51	Do.	,,	Do.	N Continent	50
52	White Pepper	,,	Do.	S. Continent	...
53	Do.	,,	Do.	N. Continent	80
54	Do.	,,	Penang	S. Continent	20
55	Do.	,,	Do.	N. Continent	60
56	Black Pepper	,,	Do.	S. Continent	50
57	Do.	,,	Do.	N. Continent	...
58	Sago Flour	,,	Singapore	U. S. A.	...
59	Do.	,,	Do.	Continent	775
60	Do.	,,	Do.	Glasgow	100
61	Gambier	,,	Do.	Glasgow	...

					Tons.
62	Gambier	Str.	Singapore	U. S. A.	...
63	Flake and Pearl	,,	Do.	Do.	...
64	Cube Gambier	,,	Do.	Do	...
65	White Pepper	,,	Do.	Do.	...
66	White Pepper	,,	Penang	Do.	...
67	Pineapples	,,	Singapore	Do.	...
68	Gambier	,,	Do.	S. Continent	...
69	Copra	,,	Do.	Marseilles	...
70	Black Pepper	,,	Do.	S. Continent	...
71	White Pepper	,,	Do.	S. Continent	...
72	Black Pepper	,,	Do.	U. S. A.	...
73	Do.	,,	Penang	U. S. A.	...
	1,750 tons Gambier 350 ,, Black Pepper		Contracts		

Export Telegram to Europe and America.

For Fortnight ending 30th June, 1904.

Wired at 3 p. m. on 1st July, 1904.

					Tons.
10	Tin	Str.	Singapore & Penang	United Kingdom &/or	1,596
11	Do.	,,	Do.	U. S. A	1,035
12	Do.	,,	Do.	Continent	340
13	Gambier	,,	Singapore	London	50
14	Do.	,,	Do.	Liverpool	...
15	Do.	,,	Do.	U. K. &/or Continent	480
16	Cube Gambier	,,	Do.	United Kingdom	10
17	Black Pepper	,,	Do.	Do.	80
18	Do.	,,	Penang	Do.	10
19	White Pepper	,,	Singapore	Do.	10
20	Do.	,,	Penang	Do.	20
21	Pearl Sago	,,	Singapore	Do.	20
22	Sago Flour	,,	Do.	London	480
23	Do.	,,	Do.	Liverpool	...
24	Tapioca Flake	,,	Singapore & Penang	United Kingdom	300
25	Do Pearl	,,	Do.	Do,	70
26	Do. Flour	,,	Penang	Do.	850
27	Gutta Percha	,,	Singapore	Do.	10
28	Copra	,,	Singapore & Penang	Do.	...
29	Buffalo Hides	,,	Singapore	Do.	30
30	Pineapples	,,	Do.	Do.	cases 26,000
31	Gambier	,,	Do.	U. S. A.	975
32	Cube Gambier	,,	Do.	Do.	130
33	Black Pepper	,,	Do.	Do.	120
34	White Pepper	,,	Do.	Do.	10
35	Black Pepper	,,	Penang	Do.	200
36	White Pepper	,,	Do.	Do.	10
37	Nutmegs	,,	Singapore & Penang	Do.	9
38	Flake and Pearl	,,	Do.	Do.	200
39	Pineapples	,,	Singapore	Do.	cases 1,500
40	Do.	,,	Do.	Continent	cases 2,000
41	Gambier	,,	Do.	S. Continent	100
42	Do.	,,	Do.	N. Continent	360
43	Cube Gambier	,,	Do.	Continent	40

					Tons.
44	Tapioca Flake	Str.	Singapore & Penang	Continent	540
45	Do. Pearl	,,	Do.	Do.	250
46	Copra	,,	Do.	Marseilles	940
47	Do.	,,	Do.	Odessa	...
48	Do.	,,	Do.	S. Continent	...
49	Do.	,,	Do.	N. Continent	1,050
50	Black Pepper	,,	Singapore	S. Continent	30
51	Do.	,,	Do.	N. Continent	30
52	White Pepper	,,	Do.	S. Continent	10
53	Do.	,,	Do.	N. Continent	100
54	Do.	,,	Penang	S. Continent	...
55	Do.	,,	Do.	N. Continent	40
56	Black Pepper	,,	Do.	S. Continent	30
57	Do.	,,	Do.	N. Continent	...
58	Sago Flour	,,	Singapore	U. S. A.	290
59	Do.	,,	Do.	Continent	90
60	Do.	,,	Do.	Glasgow	20
61	Gambier	,,	Do.	Glasgow	...
62	Gambier	Str.	Do.	U. S. A.	...
63	Flake and Pearl	,,	Do.	Do.	...
64	Cube Gambier	,,	Do.	Do.	...
65	White Pepper	,,	Do.	Do.	...
66	White Pepper	,,	Penang	Do	...
67	Pineapples	,,	Singapore	Do.	...
68	Gambier	,,	Do.	S. Continent	...
69	Copra	,,	Do.	Marseilles	...
70	Black Pepper	,,	Do.	S. Continent	...
71	White Pepper	,,	Do.	S. Continent	...
72	Black Pepper	,,	Do.	U. S. A.	...
73	Do.	,,	Penang	U. S. A.	...

1,100 tons Gambier } Contracts.
625 ,, Black Pepper }

Rainfall for June, 1904:—

Government Hill	... ...	Ins. 7.04
Balik Pulau	... ...	,, 5.37
Pulau Jerejak	... ...	,, 5.21
The Fort	... ...	,, 4.86
The Prison	... ...	,, 4.24
Lumut ...	... ...	,, 2.18
Pangkor	... ...	,, 2.01
Bruas	... ...	,, 1.55

M. E. SCRIVEN,
Assistant Surgeon,
Prison Observatory

Penang, 7th July, 1904.

Singapore.

Abstract of Meteorological Readings for the month from 1st to 17th June, 1904.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature. Mean Dry Bulb.	Temperature. Maximum.	Temperature. Minimum.	Temperature. Range.	Hygrometer. Mean Wet Bulb.	Hygrometer. Vapour Tension.	Hygrometer. Dew Point.	Hygrometer. Humidity.	Prevailing Direction of Winds.	Total Rainfall	Greatest Rainfall during 24 hours.
	Ins.	°F.	°F.	°F.	°F.	°F.	°F.	Ins.	°F	%		Ins.	Ins.
Kandang Kerbau Hospital Observatory	29·882	138·9	79·9	85·8	74·2	11·6	78·8	·895	78·1	82	S.W.	4·83	1·30

K. K. Hospital Observatory,

Singapore, 27th July, 1904.

A. B. LEICESTER,

Meteorological Observer.

D. K. McDOWELL,

Principal Civil Medical Officer, S.S.

Penang.

Abstract of Meteorological Readings in the Prison Observatory for June, 1904.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
	Ins.	°F	°F	°F	°F	°F	°F	°F	%	%		Ins.	Ins.
Criminal Prison Observatory	29·883	145·8	80·6	90·1	74·2	15·9	75·7	·794	70·95	71	S.	4·24	1·30

Colonial Surgeon's Office,
Penang, 12th July, 1904.

M. E. SCRIVEN,
Asst. Surgeon.

T. C. MUGLISTON,
Colonial Surgeon, Penang.

Malacca.

Abstract of Meteorological Readings for June, 1904.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
	Ins.	°F	°F	°F	°F	°F	°F	Ins.	°F	%		Ins.	Ins.
Durian Daun Hospital ...	29·832	162·0	79·2	89·8	70·4	19·3	81·7	10.53	62·9	95	S.W.	2·09	1·83

F. B. CROUCHER,
Colonial Surgeon, Malacca.

Colonial Surgeon's Office,
Malacca, 3rd August, 1904.

Perak.

Abstract of Meteorological Readings in Perak for June, 1904.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
Taiping ...	...	150	83·66	94	71	20	77·68	870	...	75	...	6·51	3·22
Kuala Kangsar ...	...	...	80·78	95	70	23	75·71	823	...	78	...	3·14	·77
Batu Gajah ...	...	159	81·51	93	70	20	76·54	846	...	78	...	1·70	·46
Gopeng ...	...	...	81·24	93	63	28	76·44	847	...	79	...	2·94	1·02
Ipoh ...	...	...	82·38	93	72	18	77·69	887	...	80	...	4·99	1·98
Kampar ...	...	...	...	93	67	22	...	...	...	...	..	6·78	2·72
Teluk Anson ...	...	...	82·63	92	69	21	77·66	880	...	79	...	6·80	2·10
Tapah ...	...	...	81·81	93	69	23	76·49	843	...	78	...	2·55	1·60
Parit Buntar ...	...	...	82·48	93	71	20	77·53	877	...	79	...	5·19	1·70
Bagan Serai ...	...	...	81·48	92	71	19	76·42	843	...	78	...	3·21	·93
Selama ...	...	...	83·66	92	72	18	77·68	865	...	75	...	4·95	1·47

State Surgeon's Office,
Taiping, 12th July, 1904.

M. J. WRIGHT,
State Surgeon.

Selangor.

Abstract of Meteorological Readings in the various Districts of the State, for June, 1904.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature. Mean Dry Bulb.	Temperature. Maximum.	Temperature. Minimum.	Temperature. Range.	Hygrometer. Mean Wet Bulb.	Hygrometer. Vapour Tension.	Hygrometer. Dew Point.	Hygrometer. Humidity.	Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
General Hospital, Kuala Lumpur	29·869	143·5	80·8	91·3	68·2	23·1	76·1	0·816	73·1	77	S.W.	3·91	2·10
Pudoh Gaol Hospital „	...	...	...	...	...	...	...	...	...	...	...	3·80	2·60
District Hospital „	...	...	...	...	...	...	...	...	...	...	...	4·18	2·17
„ Klang	...	...	...	87·7	74·2	13·5	...	...	...	...	...	1·63	1·05
„ Kuala Langat	...	...	...	87·3	71·1	16·2	...	...	...	...	...	3.12	1·14
„ Kajang	...	...	...	93·9	71·7	22·2	...	...	...	...	...	1·51	0·55
„ Kuala Selangor	...	...	...	87·6	75·5	12·1	...	...	...	...	...	2·96	1.52
„ Kuala Kubu	...	...	...	92·5	71·7	20·8	...	...	...	...	...	3·70	2·20
„ Serendah	...	...	...	...	...	...	...	...	...	...	...	1·71	0·65
„ Rawang	...	...	...	87·2	73·0	14·2	...	...	...	...	...	2·40	1·09
Beri-beri Hospital, Jeram	...	...	...	...	...	...	...	...	...	...	...	5·67	4·43
Sabah Bernam	...	...	...	...	...	...	...	...	...	...	...	3·03	2·00
Golconda Estate Klang	...	...	...	...	...	...	...	...	...	...	...	2·49	...
Ulu Gombah	...	...	...	...	...	...	...	...	...	...	...	3·76	1·57

STATE SURGEON'S OFFICE,

Kuala Lumpur, 15th July, 1904.

E. A. O. TRAVERS,

State Surgeon, Selangor.

Pahang.

Abstract of Meteorological Readings in the various Districts of the State, for the month of June, 1904.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean, Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
Kuala Lipis ...	...	...	...	94·0	67·0	18·76	...	...	...	...	...	5·29	1·01
Raub ...	...	...	...	92·0	69·0	19·30	...	...	...	...	...	3·71	1·70
Bentong ...	...	...	...	94·0	70·0	18·23	...	...	...	...	...	2·64	·99
Pekan ...	...	...	...	95·0	70·5	18·71	...	...	...	...	...	7·19	1·71
Kuantan ...	...	...	...	83·0	70·0	13·00	...	...	...	...	...	12·50	3·50
Temerloh ...	...	...	...	93·0	70·0	23·00	...	...	...	...	N.W.	3·62	1·50

Kuala Lipis,
13th July, 1904.

Pahang.

Abstract of Meteorological Readings in the various Districts of the State, for July, 1904.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
Temerloh ...	...	...	...	93	72	21	...	...	...	...	N.W.	2.51	·74
	...	...	...	...	...	...	...	...	...	...	...	...	...
	...	...	...	...	...	...	...	...	...	...	...	...	...
	...	...	...	...	...	...	...	...	...	...	...	...	...
	...	...	...	...	...	...	...	...	...	...	...	...	...
	...	...	...	...	...	...	...	...	...	...	...	...	...

Kuala Lipis, 31st July, 1904.

Muar.

Abstract of Meteorological Readings in Muar for the months of June and July, 1904.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature. Mean Dry Bulb.	Temperature. Maximum.	Temperature. Minimum.	Temperature. Range.	Hygrometer. Mean Wet Bulb.	Hygrometer. Vapour Tension.	Hygrometer. Dew Point.	Hygrometer. Humidity.	Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
Lanadron Estate ...	...	...	84°	92°	70°	22°	75°	...	...	...	...	6·87	1·59
						For	*July,*	*1904.*					
Do. ...	...	...	83	90	70	20	74	...	...	...	...	4.5	2.22

Muar, 1st August, 1904.

ROGER PEARS.

Kelantan.

Abstract of Meteorological Readings in Kelantan for June, 1904.

District.	Temperature.			Rainfall.	
	Maximum.	Minimum.	Range.	Total Rainfall.	Greatest Rainfall during 24 hours.
	°F	°F	°F	Inches.	Inches.
Kuala Lebir ...	89.2	71.2	18.0	5.89	2.52

Kuala Lebir, 1st July, 1904.

JOHN D. GIMLETTE.

METEOROLOGICAL OBSERVATIONS.

Table Showing the Daily Results of the Reading of Meteorological Observations taken at the General Hospital, Seremban, for the Month of May, 1904.

Date.	Temperature of radiation. 9 H	15 H	Mean.	Maximum.	Minimum.	Range.	Temperature of radiation. Sun.	Difference sun and shade.	Grass.	Difference sun and shade.	Wind. Direction. 9 H	15 H	Temperature of evaporation. 9 H	15 H	Mean.	Computed vapour tension. 9 H	15 H	Mean.	Relative humidity. 9 H	15 H	Mean.	Clouds 0 to 10. 9 H	15 H	21 H	Cloud and weather initials. 9 H	15 H	21 H	Rain. Inches.
	°	°	°	°	°	°	°	°	°	°			°	°		in.	in.											
1	81	82	81·5	87	71	16	155	68	65	6	S.E.	S.E.	74·2	73.6	73.9	0.849	0.830	0.839	80	76	78	1	1	0	B	B	B	
2	81	81	81	87	71	16	160	73	65	6	S.E.	S.E.	74·2	74.2	74.2	.849	.849	.849	80	80	80	1	1	0	B	B	B	
3	80	81	80·5	87	71	16	155	68	65	6	S.E.	S.E.	75	74·2	74.6	.867	.849	.858	85	80	82.5	3	2	0	C	B	B	.22
4	80	81	80·5	86	71	15	150	64	65	6	S.E.	S.E.	75	74·2	74.6	.867	.849	.858	85	80	82.5	2	2	2	B	B	B	
5	80	82	81	88	71	17	165	77	65	6	S.E.	E.	75	75.3	75·1	.867	.877	.872	85	80	82.5	2	0	0	B	B	B	
6	80	81	80·5	88	71	17	165	77	65	6	N.	E.	75	75.3	75·1	.867	.877	.872	85	80	82.5	2	0	0	B	B	B	
7	80	82	81	89	72	17	160	71	66	6	N.	E	75	75·3	75·1	.867	.877	.872	85	80	82.5	2	0	0	B	B	B	
8	80	82	81	89	72	17	165	76	66	6	E.	N.E.	75	75.3	75·1	.867	.877	.872	85	80	82.5	0	0	0	B	B	B	
9	80	82	81	88	72	16	160	72	66	6	E.	N.E.	75	75·3	75·1	.867	.877	.872	85	80	82.5	0	0	0	B	B	B	
10	80	82	81	88	72	16	160	72	66	6	E.	N.E.	75	75·3	75·1	.867	.877	.872	85	80	82.5	0	0	0	B	B	B	
11	80	82	81	88	72	16	160	72	66	6	S.E.	E.	75	75.3	75·1	.867	.877	.872	85	80	82.5	1	0	0	B	B	B	
12	80	82	81	89	72	17	165	76	66	6	S.E.	E.	75	75.3	75·1	.867	.877	.872	85	80	82.5	1	0	0	B	B	B	
13	80	81	80·5	89	72	17	165	76	66	6	S.E.	E.	75	76·2	75·6	.867	.897	.882	85	85	85	2	1	0	B	B	B	
14	80	81	80·5	88	72	16	160	72	66	6	S.E.	E.	75	76·2	75·6	.867	.897	.882	85	85	85	2	2	0	B	B	B	
15	80	79	79·5	85	72	13	145	60	66	6	S.E.	E.	75	75·6	75·3	.867	.888	.877	85	90	87.5	2	5	2	B	C	B	·33
16	80	82	81	89	72	17	160	71	66	6	S.E.	E.	75	75.3	75·1	.867	.877	.872	85	80	82.5	2	1	0	B	B	B	
17	80	82	81	91	72	19	165	74	66	6	N.E.	N.	75	75.3	75·1	.867	.877	.872	85	80	82.5	2	1	0	B	B	B	
18	80	82	81	90	72	18	165	75	66	6	N.E.	N.	75	75.3	75·1	.867	.877	.872	85	80	82.5	2	0	0	B	B	B	
19	81	81	81	90	72	18	165	75	66	6	N.E.	N.	74·2	76.2	75·2	.849	.897	.873	80	85	82.5	1	0	0	B	B	B	
20	81	81	81	90	72	18	165	75	66	6	E.	N.	76·2	76.2	75·2	.897	.897	.897	85	85	85	1	0	0	B	B	B	
21	80	82	81	91	72	19	160	69	66	6	E.	N.	75	75.3	75·1	.867	.877	.872	85	80	82.5	0	0	0	B	B	B	
22	80	82	81	91	72	19	160	69	66	6	E.	N.	75	75.3	75·1	.867	.877	.872	85	80	82.5	0	0	0	B	B	B	
23	81	82	81·5	91	71	20	165	74	65	6	E.	N.E.	76·2	75·3	75·7	.897	.877	.887	85	80	82.5	1	0	0	B	B	B	
24	81	82	81·5	91	71	20	165	74	65	6	E.	N.E.	76·2	75·3	75·7	.897	.877	.887	85	80	82.5	2	0	0	B	B	B	
25	80	82	81	90	71	19	165	75	65	6	E.	N.E.	75	75·3	75·1	.867	.877	.872	85	80	82·5	2	0	0	B	B	B	
26	80	82	81	90	71	19	160	70	65	6	N.E.	N.E.	75	75·3	75·1	.867	.877	.872	85	80	82.5	2	0	0	B	B	B	
27	80	81	80·5	90	71	19	160	70	65	6	N.E.	N.E.	75	74.2	74·6	.867	.849	.858	85	80	82.5	2	0	0	B	B	B	
28	80	81	80·5	90	71	19	165	75	65	6	N.E.	N.E.	75	74.2	74·6	.867	.849	.858	85	80	82.5	2	0	0	B	B	B	
29	80	80	80	89	71	18	150	61	65	6	E.	N.E.	75	75	75	.867	.867	.867	85	85	85	2	0	5	B	B	C	.87
30	79	80	79·5	87	71	16	140	53	65	6	E.	N.E.	75·6	75	75·3	.888	.867	.877	90	85	87.5	2	10	5	B	R	C	1.50
31	80	81	80·5	90	71	19	160	70	65	6	E.	N.E.	75	74·2	74·6	.867	.849	.858	85	80	82.5	2	3	2	B	C	B	

Total 2.92

J. SHEPLEY PART, M.D.,

Acting State Surgeon.

No. 8.] AUGUST, 1904. [VOL. III.

AGRICULTURAL BULLETIN

OF THE

STRAITS

AND

FEDERATED MALAY STATES

EDITED BY

H. N. RIDLEY, M. A., F. L. S.,

Director of Botanic Gardens, S. S.

CONTENTS.

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NOTICE.

The Scientific and Technical Departments of the Imperial Institute.

His Excellency the Governor has received a despatch from the Right Hon'ble the Secretary of State for the Colonies calling attention to the advantages offered by the Imperial Institute to Merchants, Planters and others, who may wish to have samples submitted to scientific experts for opinion as to their commercial value, &c. The following extracts from a Memorandum published by the Authorities of the Imperial Institute will give an idea of the work undertaken and carried on there.

"The Scientific and Technical Department of the Institute has "been established to acquire information by special enquiries and "by experimental research, technical trials and commercial valua-"tion regarding new or little known natural or manufactured pro-"ducts of the various Colonies and Dependencies of the British "Empire and of Foreign Countries, and also regarding known "products procurable from new sources, and local products of "manufacture which it is desired to export. This work is carried "out with a view to the creation of new openings in trade, or the "promotion of industrial developments."

2. In an extensive and well equipped series of Research Laboratories, a numerous staff of skilled chemists under the direction of Professor Wyndham R. Dunstan, M. A., F. R. S., carry out the investigation of the chemical constitution and properties of new dye-stuffs, tanning materials, seeds and food-stuffs, oils, gums and resins, fibres, timbers, medicinal plants and products, with a view to their commercial utilization. Whenever necessary these materials are submitted to special scientific experts, by whom they are made the subject of particular investigation or practical tests. Reports are also obtained from technical or trade experts in regard to the probable commercial or industrial value of any such products, while full information is collected from official or other trustworthy sources regarding the probable extent and cost of available supplies.

Reports on the results of enquiries or experimental investigations are supplied as a rule, without charge, but should special expenses be incurred in connection with any such reports, or with the commercial value of particular materials or manufactured products, which the Council do not consider themselves warranted in meeting, a statement of such outlays will be furnished, for repayment, when the Reports are supplied. Should an investigation or report of exceptional character be asked for by a Government Department, an estimate of the attendant expenses will be submitted, with a view to ascertain whether authority for such expenditure will be given.

3. The Federated Malay States Government has undertaken to grant a sum of £100 a year for 5 years to the Department with a view to the careful investigation and commercial development of the mineral resources of the States.

The Government Geologist is collecting specimens for chemical examination and after analysis the Imperial Institute which is in very complete touch with the principal manufacturing and other industries of the United Kingdom, will bring the specimens before manufacturers and others for trial with a view to their commercial development.

It is expected that this action will do much to help in finding a market for new products and developing the markets for those already exploited.

AGRICULTURAL BULLETIN

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No. 8.] AUGUST, 1904. [VOL. III.

THE AGRI-HORTICULTURAL SHOW OF THE COLONY AND MALAY STATES.

The first of the combined exhibitions of the Colony and Federated Malay States was held in Kuala Lumpur on August 5th, 6th and 7th, and may be described as the most successful Show ever held. The full report is not yet to hand, but will be printed later. His Excellency the Governor visited the Show on the first day, and most of the planters, officials and many others from the Native States and Colony, were present. The outbreak of rinderpest in Selangor prevented the exhibition of horned cattle, which was regrettable as some fine beasts were to have been shown.

The Forest Department had a house built of bark of *Shorea macroptera*, and roofed with attaps, in which were exhibited a fine series of timbers, rattans, dammars, wood-oils and fruit-oils, guttas, bamboos and other jungle produce. Among specimens of special interest were some very large samples of *Deudrocalamus giganteus*, the largest bamboo known. Several sleepers from the railway of Tembusu and Chengei which had been many years in use and were still in sound condition were interesting as showing the durability of the wood. Dragon's blood, from the fruits of two species of *Dæmonorops*, was shown by specimens of the fruits, the prepared product, and a piece of palm spathe coloured with it. Mr. MOORHOUSE showed a very large series of rattans with leaves and fruits, with native names. The dammars were exceptionally fine, most of the best known varieties being shown. Outside the door stood two large plants of *Dichopsis oblongifolia* in tubs. The whole formed a most interesting exhibit and reflected great credit on the Forest Department.

The next house contained the poultry and other stock, the exhibit, however, was poor on the whole. Mr. FARRER-BAYNE'S white Shanghai fowls were far the finest in the whole shed, and were very soon all purchased. Ducks and geese were few, guinea fowls fairly good, sheep and goats were few, pigs were hardly represented, one little animal alone being shown, a large crocodile, a bear and a deer were also exhibited in this enclosure.

This part of the Show was perhaps the weakest. We have seen much better. Tapioca, both in root and prepared was fairly well represented. Jungle produce was poor in the matter of resins, but there were some good collections of bamboos and rattans, and branched, twisted, and spotted bamboos were shown. The prize given by Dr. DANIELS for a collection of specimens showing plant diseases was won by his mandor with an interesting collection, otherwise there was little competition. Native medicines also were fairly well shown.

The house containing native industrial work was not large enough for the enormous amount of models, mats, hats, carving, embroidery, etc. This was the most attractive part of the Show, and far the finest collection of native work ever on view in the Straits. A very large proportion found ready buyers, and those who did not get prizes were gratified by selling their exhibits at good prices. If it could be arranged to have a bazaar for the sale of these curios in Singapore or Penang, there would doubtless be a good demand for them by globe-trotters, and the dying arts of the Malays revivified. Fruits, flowers and vegetables were contained in another house. The season was backward for fruits and the exhibition was not as good as it might have been, but the Malay States have always been poor in fruit culture. There were, however, some good limes, notably those from Kamuning estate, some fair pines and other fruit. Large heads of Nipah, *Zalacca conferta* (Asam Payah) and other wild fruits were very attractive. Vegetables were also not as good as they might have been, but the special prize for a collection of vegetables was awarded to a Chinaman for a really first class exhibit.

Flowers and pot plants were perhaps the weakest part of the Show, and Mr. KIM KEAT of Singapore took away the prizes for *Dracœnas*, *Caladiums*, and for the best plant in the Show, a fine pot of *Peperomia metallica*. Mrs. TREACHER and Mr. CAMPBELL also showed some fine pots of ferns, etc., and some pots of Asters and Chrysanthemums deserve special mention. Mr. CAMPBELL of the Thaiping Gardens showed for exhibition only a remarkably fine series of flowers, fruits and vegetables, which occupied a large space, and deserved high commendation. Better exhibits at Malacca, and the show of stock at Penang at previous Shows was infinitely superior. The agricultural produce was very good on almost all lines. What rubber was shown was remarkably good, and Mr. LAKE easily carried away the prizes for Para rubber. It was hoped that a very large exhibit of this might have been shown, but though the samples were superb one would have liked to have seen more of them. Unfortunately too they were staged at the back of the house in a rather too dark spot so that they were less easily seen than they should have been. The front of the house was occupied to a large extent with coconuts, and these were as good a show as could be desired, both in quantity and quality, and gave the judges some work to make their selection. Arrowroot was well shown both in raw and manufactured state. Mr. NORRIS of Singa-

pore coming well to the front with first class samples of both. Spices were about the average, nutmegs and pepper good, ginger and turmeric rather poor, the latter mostly badly grown, the rhizomes being small and malled.

Tea was represented by only two exhibits, of rather special type, and the diminution in coffee planting in the Federated Malay States was shown by the scanty exhibition of samples. Cacao was shown but all unripe. Sugar as regards coconut, nipa and arenga sugar was very good. Cane sugar was more scantily represented, but it is unnecessary to say more of the first prize sample than that it came from Caledonia Estate. Of fibres, the most attractive exhibit was Mr. SCHIRMER'S large case of different fibres prepared in Singapore by his new machine, they included fibres and leave specimens of *Sanseviera zeylanica*, and *guineensis*. *Agave Americana*, and another species, *Fourcraya gigantea* and *cubensis*, *Pandanus kaida*, and *macrophylla*, Ramie, Pineapple, and *Bromelia-pinguin*.

Some of the samples turned out by this machine are exquisitely white and silky. *Bromelia pinguin* was especially interesting because it has always been said that its fibre is too dirty coloured for use, but here it was whitest of any.

Kapok was well shown, but owing to the season's rains was nearly all more or less discoloured.

Cotton was good considering the climate here, a high commendation.

The Dog Show though small contained some very fine animals, especially noticeable being the retrievers, shown by Mr. CAREY and Mr. BAILEY.

During the Show Mr. P. T. BURGESS gave a lecture and demonstration on the chemistry of Para rubber which was very well attended, and had to be repeated thrice. A washing machine was erected by the Federated Engineering Company, and its use demonstrated very successfully.

To sum up the exhibition was a very good one and there can be no doubt that the utility of such Shows to the advance of agriculture and native industry. The next exhibition is to be held next year at Penang, and we hope it will be as successful as the one held this year in Kwala Lumpur.—*Editor*.

RUBBER IN CEYLON.

Mr. PEARSON in the *India Rubber World* publishes each month an instalment of his experiences in his travels in Ceylon and the Malay States in a chatty and pleasant manner. The instalment for July almost finishes his account of Ceylon. He visited Mr. HARRISON'S Culloden Estate, where he noted the trees were growing well in rocky soil, but less well in damp ground. The oldest trees on the estate are about 18 years old and produce 3 lbs. of rubber a

year, but the planter expects to get 6 lbs. by scraping the bark. The Para tree varies a good deal in the amount of return it gives according to its position, size, etc. Trees at Kamuning Estate about the same age as the Culloden ones are giving, I understand, some as much as 8 lbs. and the average 4 lbs. per tapping.

As the rubber on the Culloden Estate is only rolled out by hand rollers, it is not surprising to hear it takes a month to six weeks to dry. Acetic acid is used, and the biscuits are first dried over a charcoal fire for 3 or 4 hours, and then transferred to a drying room and air dried. The use of heat in rubber drying is objectionable as the fibre of the rubber deteriorates with it.

M. OCTAVE COLLET who has recently in Singapore expressed himself very pleased with the Malay Peninsula rubber, stating that the texture was much superior to that of the rubber turned out in Ceylon which was less elastic and more resembled recovered rubber than new first class stuff. This is probably more due to bad methods of preparation than to any inherent defect in the Ceylon rubber.

In Mr. HOLLOWAY'S account (*India Rubber Journal*) of his methods of preparation of biscuits, he states that he does not use acetic acid or any chemicals but dries only with hot air. The cakes are rolled out with the clumsy rolling-pin, and take two months to dry without hot air and three weeks with it. The average price of his rubber sold in 1903 was 4/4½*d.*—*Editor.*

FIBRE PLANTS OF THE MALAY PENINSULA.

It may seem somewhat remarkable that in a country so rich in fibre plants and so suitable for their culture, so little has been done or attempted even in the cultivation or preparation of these fibres for trade purposes. Except in the case of ramie, little interest seems to have ever been taken in the subject.

To a large extent perhaps this apathy is due to the fact that for some classes of fibres cheap labour is required, which has never been procurable here, while the machinery which has occasionally been imported for working the fibres has often proved unsuccessful, which in some cases has been due to ignorance on the part of the importer.

The fibre trade is one of considerable fluctuation, and the profits not as large as the prospective ones of rubber, and in the old days of coffee, still many fibres might be grown and worked to pay as catch-crops, while the rubber were growing and it would be quite possible to induce the natives to collect and prepare many of the native and half wild fibres if only some encouragement were given to them in the way of farming markets where they could sell their produce at a reasonable profit.

The number of fibre producing plants which are wild or can be successfully cultivated in the Malay Peninsula is large, and an account of them may be of interest to the readers of the Bulletin.

Fibres can be classified into bark or bast-fibres, and leaf-fibres. The former being all derived from *dicotyledonous* plants, the latter from *monocotyledons.*

Leaf-Fibres.

The leaf-fibres suited for this country are those derived from *Sanseviera*, *Agave*, *Fourcroya*, *Yucca*, *Pandanus*, *Musa*, *(Bananas)* (*Ananas*) Pineapple, *Bromelia pinguin*, to which may be added *Curculigo* and the palms *Arenga Caryota.*

Sanseviera.

There are five or six species of *Sanseviera*, most of which are natives of Africa, but several of them seem closely allied and are possibly not specifically distinct. Four kinds have long been grown in the Botanic Gardens, Singapore.

S. Roxburghiana, the Indian Species, Murva.
S. Guineensis, Konje hemp.
S. Cylindrica, Ife hemp.
S. Ehrenbergii, a dwarf kind, of no use for fibre.

The three first mentioned species all produce excellent fibres which have long been known as bow-string hemps, and extensively used in the countries in which they are indigenous; as cultivated plants, except for ornament, they have been hardly ever brought into trade, although the samples of fibres which have been obtained from them have always been very highly valued. With suitable machinery there can be no reason why they should not be grown as catch-crops by rubber planters and others who have to wait for some years before their main crop comes into bearing.

Cultivation.

All the best kinds are cultivated in the same way and grow with the utmost readiness in the Straits Settlements with very little trouble. They can be propagated from small pieces of the orange coloured rhizome which is usually as thick as a pencil; pieces two or three inches long readily throw up shoots in damp soil and grow rapidly. They can equally well be propagated from leaf-cuttings. The leaves are cut up into pieces about three or four inches long and stuck into sandy damp beds or boxes on their edge about an inch deep. In a fortnight or three weeks roots and then shoots are produced from the lower edges, and soon after the little plants can be planted out. The soil that they prefer is rather open and fairly damp, sandy or ordinary loose soil suits them well, but in very stiff clay they grow less satisfactorily. Partial shade is requisite in order to get the leaves fully developed to their largest size. They remain stunted and poor in full sun, but at the same time they are averse to heavy shade, where though they grow persistently for many years they do not produce the dense mass of leaves that they do in quite light shade. The plants when old enough often throw up their tall spikes of white flowers like those of a *Dracœna*, and produce orange-coloured fruits. But it is so much more easy to re-produce the plant from leaf-cuttings or slips that it is not worth while to trouble to raise them from seed.

The plants last for very many years in the same ground, which if left gets quite malled with their rhizomes, and then they produce abundance of large leaves. They are in fact very hardy plants and will stand almost any treatment.

Preparation of the Fibre.

The preparation of the fibre can be done by cleaning by hand but this is slow and expensive. Very finely prepared specimens of fibre of the three species in common cultivation here were shewn at the Agri-horticultural Show by Mr. SCHERNIER who had prepared them with the aid of a decorticator and a cleaning machine for which patents are being taken out and these samples were as perfect specimens of what a fibre should be as possible, and attracted the attention of many visitors to the Show.

S. Guineensis, Willd, is a widely spread plant over most of Africa. It has a stout orange coloured rhizome and broad lanceolate leaves 3-4 feet long and 2½ to 5 inches across pale green mottled with lighter colour, or often plain with a fine red edge. The flower spike is nearly as tall as the leaves with white flowers about 1½ to 2 inches long and orange coloured fruit.

This is the Konje hemp. Sir D. MORRIS recommends the planting of it three feet by three feet which gives about 3,000 plants to the acre. Its rate of growth seems to be slow in the West Indies. Plants he saw in St. Thomas three years old were only just ready to cut, and Baron EGGERS after cultivating them said that they could not be cropped before 3½ years; but much depends on the soil and conditions of growth and also the size of plants when planted. My impression here from our cultivated plants is that it is much more rapid than this.

In experiments in Jamaica, 1,185 lbs. fresh leaves gave 29 lbs. 12 ozs. dry fibre. The fibre was valued at about £30 per ton at that time, with Manila hemp fetching £31.

The specimens prepared by Mr. SCHERNIER for the Agricultural Show were as fine and silky as could be, and it like *S. Zeylanica,* is a plant well suited for his machine.

S. Cylindrica, Bojer, Ife hemp.—This has a similar stout rhizome to that of the preceding, but the leaves are quite cylindrical three or eight together, three or four feet long and about half an inch through deep green smooth to its sharp point. It has never flowered in Singapore Botanic Gardens.

It can be propagated in the same way as the other species, but does not seem to me to be so fast a grower. However, I do not think it has had a very fair trial as yet. It has not thoroughly established itself about the country as *S. Zeylanica* has done, but it is hardly an ornamental plant and hence has been less carried about.

Specimens of fibre prepared at Kew were valued at £28 per ton by IDE and CHRISTY who stated that except that it did not appear quite as strong it is almost equal to *S. Longiflora.* Later experi-

ments showed that it was the strongest and best fitted fibre for deep sea soundings of any kind known. It has been long used for cordage, cables, etc., by the Portuguese in Angola. Owing to its stiffness and form, it is easier to handle in cleaning by machinery, and specimens cleaned and exhibited at the Agricultural Show were good white and silky fibre.

S. Ehrenbergii, Schwemf.—A Nubian and Arabian species is in cultivation in the Botanic Gardens, Singapore. It was received from Kew some years ago, and is at present quite a small plant. Its recurved distichous thick leaves like those of one of the small aloes gives it a very quaint appearance. The leaves which are half round with a broad groove above and a sharp point are very short in our plant, but they attain a length of four to seven feet. The fibre though merely beaten out by the Somalis with sticks, and very roughly prepared was (in 1892) considered as a very good strength and colour.

It is probable, however, that the climate is too damp for this species, for our only plant has made but little growth since its arrival.

S. Roxburghiana.—This is the name of the common cultivated species here, which is a native of India. It has long been grown as an ornamental plant and is very widely spread and abundant all over the Peninsula. An account of it under the name of *S. Zeylanica*, Murva fibre, was published in Bulletin, Vol. II, p. 220. It is perhaps the easiest to grow but the leaves are not as tall or broad as those of *S. Guineensis*. It works well with machinery and produces an excellent fibre.

COTTON AT PORT DICKSON.

PORT DICKSON.
2nd September, 1904.

DEAR MR. RIDLEY,—I forwarded to you yesterday by Parcel Post a small box containing samples of cotton obtained from the plants I received from you some months ago. I have never seen a proper sample of cotton so cannot say whether those I have sent you are good, bad or indifferent. The staples of the cotton are certainly not conspicuous by their length.

You will doubtless remember you forwarded to me young plants of Sea Island, Egyptian and Upland Cottons.

The Sea Island seemed to do very well indeed at first, but after a while they became unhealthy in appearance, and every boll which they now carry shows signs of having been pierced by a worm or grub, the latter measuring about five-eighths of an inch long. An examination of the inside of the boll clearly proves that the worm or grub entering it are bent on devouring the seeds.

I have noticed a peculiar kind of fly—red back with black spots—on the plants on several occasions, and I have no doubt the grub

referred to were hatched out of their eggs. So far, then, I consider my attempts to grow Sea Island Cotton here successfully a failure.

Egyptian Cotton.—These plants have done better than the Sea Island and have not suffered, up to the present time, from the attacks of worm or grub. Given dry weather about the time the crop is ready to be gathered, other things being equal, I should imagine they would yield fair results.

The Upland Cotton plants look healthiest of all, but I am sorry to say they, like the Sea Island Cotton plants, are being attacked by the worm or grub to a small extent only, however.

The rains during the past month have been very heavy and therefore inimical to the successful growing of cotton. Until the rain came I could not detect that the plants were being attacked in the manner above indicated.

I am now arranging the planting out of further seeds so as to get a crop somewhere about the months of February and March—months during which, as a rule, we have very little rain here. Until this is done the question of the suitability of this locality for growing cotton cannot be satisfactorily settled.

I have, etc.,

D. C. NEAVE.

Of the samples sent by Mr. NEAVE the best is the Upland Cotton which is clean, white and of moderate staple, but not long, more of the nature of Indian Cotton. It is tolerably strong. A better cotton all round than Sumatran either Battak or European grown, and better also than samples received some years ago from Labuan. It is however hardly equal to that grown in the Botanic Gardens in Malacca some years ago.

The Sea Island is shorter, but in colour and texture very similar, clean and white.

The Egyptian is short stapled and discoloured, and altogether inferior.

The grub devouring the seeds referred to in his letter is not known to me. The "Fly" is obviously the cotton bug *Dysdereus cingulatus*, a troublesome pest. Its larvæ are of course not grub-like at all, but small scarlet wingless bugs. It has often been described in the Bulletin.

AN ANT-KILLER.

The Porto Rico Agricultural Station publishes a leaflet on a preparation for destroying ants which attack the leaves of orange trees. Fortunately the East is free from any kinds of leaf-eating ants, but the preparation might be worth trying on termites. The following is the Recipe:—

Resin 2 parts, Sal Soda 1 part, Tobacco tea 1 part. Boil all together stirring slowly over a slow fire till all the resin is dissolved. After simmering about 15 minutes, remove from the fire and add little by little 10 to 15 parts of tobacco tea, stirring rapidly for five minutes or more. This should produce a very frothy soap which contains only just enough of the alkali to hold the resin in solution. Apply with a large syringe or coarse holed spray pump directly to the open holes or galleries of ants' nests. It should not be used in large quantities round the roots of young trees since the caustic action of the soda might injure the small roots. As the termites do not make the long galleries which ants do, it would be necessary to bore under the tree till near the nest and then inject the material. It might be worth while trying this remedy.

In the same leaflet a paint for healing wounds and preventing the attacks of insects is described as follows:—Four parts of common yellow resin and 3 parts by weight of linseed oil, preferably raw, melted together over a slow fire and boiled for about ten minutes. After removal from the fire but while still hot, this liquid is beaten up with a small per cent of cold tobacco tea, about half a pint of the tea to three pints of the resin mixture. The tobacco tea should be added little by little while the wax is being stirred.

As a rule people here use tar for tree wounds, such as those caused by a broken bough, but this preparation would probably be better.—*Editor.*

STERCULIA SCAPHIGERA.

Sterculia Scaphigera, Wallich., the Kembang Semangko of the Malays is at present fruiting in the Botanic Gardens, Singapore, in the garden jungle. It is a tree of considerable size, flowering when about 60 feet tall but eventually attains a much greater height. The leaves are ovate dark shining green and stiff in texture on long petioles. The tree flowers about June shedding its leaves completely previously. The flowers are small and yellow and produced in great abundance, and are unisexual. The fruit is very curious, consisting of from one to five large green papery boats about 6 inches long at the base of which is a black wrinkled seed oblong or rounded about an inch long. One of these seeds put in a tumbler of water exudes such a large amount of mucilage that in a few hours the cup is nearly full, and hence the Malay name Kembang Semangko, or fill-cup. This mucilage, which resembles gum arabic in appearance, tastes something like boiled sago, and is eaten with a little sugar by Malays to clear the mouth in the morning. The seeds dried are exported to China, and used as a remedy for dysentery, and was formerly sent to France under the name of Boa-tampaijang. An analysis given by GUIBERT gives 59·04 per cent of bassarin, a substance also found in gum Tragacanth, it acts as a demulcent and is very cooling and pleasant to taste. The seeds are sold in the local

shops at the price of about 6 seeds for a cent. The tree occurs in Burmah, down the Malay Peninsula to Sumatra and is not uncommon in Malacca and Singapore.

SWAMP GROWTH IN THE TANJONG BURONG BAKAU RESERVE, DINDINGS.

It might be interesting to note the process of elimination that goes on at Tanjong Burong, as it will to some extent throw light on the struggle for existence that is carried on upon recent alluvial deposits.

On the Kwala Bruas a thicket stage of Api-Api meets the eye in successive age classes for a little over a mile, when Lengadie is first seen in like gradations marking the introduction of the species and the elimination of Api-Api and Brembong, which yield a smoky fuel and having a crooked bole are difficult to split.

The sandbanks down the river are gradually sown up by Api-Api from bird-droppings and these when grown up, fertilize the soil paving the way for the entrance of Lengadie and Bakau. When the soil has attained this stage of fertility, Api-Api does not seem to put forth any energy to hold its own as the conditions for growth are even in the struggle for existence. The seedlings now have not the same vitality as that which produced the parent trees from bird-droppings and the species being low crowned does not grow quite close together so as to provide for a struggle in the root-systems of intruding species, whereas Lengadie has a tendency to form a pure dense gregarious forest and in the course of a revolution completely chokes out Api-Api. It is also a shade bearer and in the thicket stage has dense spreading crowns; it seeds profusely and gradually encroaches into the Api-Api at spring tides and there establishes itself while the birds prefer the sandy banks where they can feed on worms and no longer have any attractions to enter on the sown up tracts.

The growth of Api-Api on newly formed banks is advantageous; when it has done its work of settling the deposit it gives way to the Lengadie and Bakau which are so much used as fuel.

V. P. BORGES.

A LEAF-FUNGUS ON HEVEA BRAZILIENSIS.

I have received from Mr. COATES of Seremban some leaves of the Para Rubber tree, infected with a leaf-fungus, the first I have seen from the Malay Peninsula. The leaves are all deformed, being curiously narrowed, with the nerves very irregular, wavy and ascending towards the tip. In some cases running parallel to the mid-rib for a short way. They are also very inœquilateral, one side of the leaf being much narrower than the other. Scattered over the leaf are pale whitish orange patches of dead tissue. These are $\frac{1}{8}$ to $\frac{1}{4}$ of

an inch across irregular in outline with a raised edge. In some cases the disease has run along the edge of a nerve which is thickened and pale orange. The tissue on these spots is completely destroyed so that the spots are equally clear on both sides. By the aid of a lens minute black dots can be seen usually on the upper surface. These are the fruiting apothecia of a leaf-fungus which has destroyed the inner tissues of the leaf. From them are being discharged from a split at the top a large number of black spores, apparently teleutospores are produced, they are fusiform or five septate, the three central ones being dark the others transparent.

The fungus appears to be one of the *Uredineæ* and may prove a serious pest. All infected leaves should be removed and burnt and if necessary the plants attacked should be disinfected with Bordeaux mixture.

BIBLIOGRAPHY.

We have lately received the following books and papers of interest to planters:—

Ziekten in Klapperaan plantingen by Dr. J. C. KONNINGSBERGER.

This is a short paper of 10 pages on pests in Coconut planting published in Teysmannia.

The chief pests in Java seem to be squirrels, flying squirrels, fox-bats, the two well known Coconut beetles and the caterpillar of *Amathusia phidippus.* There is a good plate of the beetles and their grubs, and a figure of a caterpillar of Amathusia, which however looks different from the one we know here. Grasshoppers, *Acridium Melanocorne Sero*, are also mentioned as destructive insects.

The Consular report on French Indo-China for 1903-1904 states that rubber plants grow in a wild state over wide areas and the apparently suitable conditions for their growth combined with the large and increasing demand for rubber seems to warrant the expectation of a rapid development in its production. The quantity exported rose from 53 tons in 1899 to 340 tons in 1900, but fell to 266 tons in 1901. The high prices offering have led to a somewhat reckless draining of the sources of supply during the last few years but regulations are now being enforced to prevent wasteful destruction of plants and to encourage re-planting. A factory with a capacity of two to five tons a day for the treatment of "Ecorus de Parameria" is in operation at Cholon (Cochin-China) and others are projected.

[The rubbers of this region chiefly consist of Willoughbeias, Paramerias, etc.—*Editor.*]

Experimental plantations of Isonandra Gutta have been established in five or six places but it is too early yet to predict what the results will be. A native variety (*Dichopsis Krantziana*), is widely

distributed and recent tests made by the Chemical Laboratory at Saigon seem to show that it is a valuable product.

[The Gutta from *D. Krantziana*, of which specimens are in the Museum of the Botanic Gardens, and young plants in the Economic Gardens is a very inferior white Gutta not unlike that of *D. obovata*, which also the young plants much resemble. It is useless for deep-sea cables, the most important use of Gutta percha.—*Editor.*]

CITRONELLA OIL.

There seems to be an opening for trade in Citronella Oil in Australia at present. Messrs. PHIPPS, TURNBULL & CO. of Melbourne, write to the Director of the Botanic Gardens stating that they wish to represent an exporter or firm interested in this product. They are accustomed to dealing in it and can handle it to advantage. A fair export trade could be established with Australia, if local agents co-operated.

[Messrs. PHIPPS, TURNBULL & CO. is a very old firm in Australia, having been established in 1840.—*Editor.*]

HORTICULTURAL NOTES.

Crinum northianum, Baker.—This fine Crinum was originally described by Mr. BAKER of Kew from a drawing by Miss MARIANNE NORTH, in the beautiful collection of drawings made in various parts of the tropics and now preserved at Kew. The plant, however, seems never to have been brought into cultivation though common in muddy ditches near Kuching, Sarawak, where I found it in flower a year ago. Through the kindness of Bishop HOSE, we have received a number of plants, of which one has come into flower. The plant resembles the common seashore *Crinum asiaticum*, but seems quite distinct. The root produces long subterranean suckers and is in fact stoloniferous throwing up shoots from these long underground shoots. I have never seen anything like this in *C. asiaticum* which seldom if ever produces side shoots. The leaves are very long linear and about five or more feet long and three inches wide forming a large tuft. The inflorescence is shorter than the leaves, the stout peduncles being 18 inches long and half an inch thick, pale green. It is produced from the lower axils of the stem. The flowers 12 in the plant now in flower, but said to be 30 or 40 in number in fully developed plants, are crowded into a terminal head and at the base are three lanceolate reflexed bracts, the biggest three inches long. The flower tube is six inches long, pale olive green. Petals and sepals linear white tinted and tipped on the back with pink, recurved linear four inches long three-eighth inch wide. The stamens an inch shorter are deep crimson with black anthers (not yellow as in *C. asiaticum*). The style also deep pink is shorter.

[This handsome and apparently easily grown plant is a welcome addition to our ornamental bulbs.—*Editor.*]

PREPARATION OF RUBBER.

By P. J. Burgess.

The Committee of the Agri-Horticultural Show held in Kuala Lumpur early in August, 1904, invited me through the Government of the Straits Settlements to give a lecture and demonstration on the chemistry and the mode of preparation of marketable rubber. The following account of the lecture I have written at the special request of the Federated Malay States Government, and in it I have tried to repeat as far as can be done those facts and ideas which were then publicly stated and which were illustrated by experiment. The lecture was not written out beforehand neither were formal notes of it prepared and consequently I can, in this account of it, only give the substance and not the form of what at Kuala Lumpur was partly lecture, partly demonstration and partly discussion.

The trees on which the attention of so many is now fixed are of two kinds Hevea Brasiliensis, the Para rubber tree, and Ficus Elastica or Rambong. Those trees I shall not describe, neither shall I discuss the mode of extraction of the "latex" from the tree, but suppose that the latex has been extracted and is now ready to be examined.

In appearance it is a white or pale yellow milky liquid—its odour is pleasing and faintly aromatic, and if tasted it is found to be slightly sweet. In reaction it is, when fresh and pure, the reverse of acid, that is to say, slightly alkaline. If greatly magnified it is seen to consist of innumerable minute globules floating in a colourless clear liquid. The globules are in size comparable to bacteria, and though passing freely through ordinary filters can be separated by means of Pasteur Chamberlain filter tubes.

These globules consist of rubber mixed with a small but variable percentage of oils and resins, the nature of which has not yet been worked out.

The liquid in which they are suspended is water carrying in solution some gum, sugar, mineral salts and proteid or nitrogenous matter.

Some of this liquid was prepared by filtering the latex and shewn during the lecture. This liquid when filtered from fresh latex shews an alkaline reaction; if an acid such as acetic acid be added a chemical reaction takes place and the proteid is thrown out of solution, appearing as a fine precipitate, at first barely visible as a faint opalescence but which finally settles out and sinks, leaving the clear liquid above.

This reaction gives the key to the explanation of the coagulation of the latex on the addition of acid, a method very generally practised by rubber growers. The rubber globules in suspension in the original latex do not interfere with the proteid precipitation which occurs on the addition of acid, but they are caught and

tangled up in the precipitate which is formed throughout the bulk of the liquid. The freshly coagulated latex may be regarded as a very fine sponge of freshly precipitated proteid laden with rubber globules. As the sponge contracts it brings these globules into contact and the mass which at first has little or no coherence becomes compact and capable of being handled.

This coagulation of rubber in latex is precisely analogous to the "clearing" of turbid soup by the addition of white of egg and boiling—the white of egg coagulates throughout the soup and the solid thus formed entangles and carries down with itself all the minute particles of solid which in the soup gave the muddy appearance and which were too minute to settle out alone.

The same principle is adopted in clarifying crude sugar solutions or even in clearing ordinary tap water if a particularly brilliant liquid is required as is the case in the manufacture of aerated waters.

It is very important that these ideas be clearly grasped, and it is then easy to understand why latex coagulates on merely keeping for a day or two, and the influence of certain chemicals in retarding the coagulation.

The latex is as a whole a complex liquid containing organic matters, gum, sugar, and proteid, in solution which readily ferment and putrefy. The products of putrefaction are highly complex, but the important point to notice is that certain acids are produced, the latex becomes sour, and these acids lead to a precipitation of the proteid in precisely the same way that acetic acid does when added to fresh latex. The natural consequence is that as soon as the latex becomes sour, usually after a few hours, natural coagulation takes place, any drug, such as formaldelyde—better known in solution as formalin—which will prevent fermentation and putrefaction will hinder or entirely arrest the natural coagulation of rubber latex. Any alkali such as ammonia or caustic soda which neutralises the acid products of decomposition will, as long as it remains in excess, keep the latex perfectly liquid and free from coagulation.

The use of formalin or a mixture of formalin and ammonia to prevent the coagulation of freshly gathered latex in the collecting cups is quite familiar and the manner in which it acts I have tried to explain.

The mode of preparation of rubber in use at the present time commences with straining the latex, then acidifying, stirring, and pouring into shallow dishes to set—after 24 hours the slabs of firm coagulum are taken out, drained and rolled out by hand rollers, or through wringing presses, and white firm cakes are produced. These are hung up to dry, an operation that takes anything from one to six months, and which is frequently hastened by artificial heat.

This method I intended to severely criticise, not because it fails to produce good marketable rubber, but because it is not the best

and the faults which underlie it can be easily removed. But before doing this the problem to be solved and the material under treatment should be furthur considered. The wet slabs of freshly coagulated rubber are composed of the following ingredients. Rubber, proteid, oils, and resins making up the solid matter, and a watery liquid full of those impurities—the gum, sugar, salts and excess of acetic acid—which were present in solution in the latex during coagulation.

While the slabs are rolled and pressed, much of the watery liquid is expelled, but a limit is quickly reached and when the slabs are set apart to dry there is usually fifty per cent or more of this watery liquid with the impurities dissolved in it still adherent to the rubber "sponge." On drying the water itself evaporates but leaves behind in the rubber whatever gum, sugar, salts or other soluble matter it previously contained.

These are impurities which can and should be removed from rubber—the other impurities, the oils, resins and coagulated proteid which are not soluble in water, cannot be removed and may be neglected. The rubber slabs in their wet condition begin to putrefy and become most offensive, and during the long period of drying much attention is required to keep them moderately free from mould. This is entirely due to those impurities which were soluble in water and which are being dried up inside the rubber slab. The rubber itself undergoes no appreciable change and it is doubtful whether it is in any way eventually damaged by the putrefaction which occurs in drying. At the same time by spoiling the pretty appearance of the rubber sheets, the mould and decomposition products detract from the price the dry rubber commands, and it is a source of annoyance and very disagreeable to the rubber producer.

The slabs take a long time to dry because the outside film which quickly dries seals the inner portions, and slabs which are half an inch thick are not dry at the end of many months. As the slabs dry the colour changes from white to grey and finally when dry the rubber is transparent. A sheet of rubber may be taken to be dry when the grey colour is no longer apparent in a freshly cut surface.

All raw rubber before it is vulcanised by combination with sulphur, is very sensitive to heat, a temperature of 150°F. renders para rubber quite sticky on the surface, and a higher temperature utterly destroys the "nerve" of it. It is consequently very injudicious to use any artificial heat in hastening the drying of rubber. If some artificial heat were absolutely necessary a very carefully regulated temperature never exceeding 120° F. would probably not cause any evident damage, but bearing in mind the fact that a temperature of 150° F. does produce marked damage the sound policy is, I feel sure, to avoid artificial heat altogether. I may here mention that I have subsequently visited many plantations and seen rubber being dried with the aid of heat and in no case did I fail to find some rubber that had been clearly overheated. Fortunately it is possible

to dry rubber quite well and satisfactorily without any artificial heat by the use of some agent that will dry the air. For this purpose I recommend calcium chloride. This substance is made commercially on a large scale, it is comparatively cheap being about 30/- a hundredweight and it is very effective as a drying agent. The material as bought is in white granular lumps which when placed in open air absorb moisture from the air and the calcium chloride becomes moist and eventually absorbs so much water that a syrupy liquid results. The great merit of this substance lies in the fact that it can be recovered from the wet state by simply heating and thereby driving off the moisture. A simple form of rubber drying shed adapted for use with calcium chloride could easily be made by building a brick chamber capable, when the rubber is turned out in sheet or "biscuit" form, of holding a month's output, cementing the floor, fitting inside the usual stacks for the rubber, but in addition having above the rubber stacks, shelves to hold iron pans in which the calcium chloride could be placed and freely exposed to the air in the chamber. As the calcium chloride absorbed the moisture and became sloppy, the pans should be removed and the water driven off over a brisk fire stirring the mass meanwhile. When quite dry and porous again the pans should be returned to the rubber drying chamber to do their work again. In this way there would be little or no loss of substance, and the air inside the chamber being constantly dry mould would be absolutely prevented and the rubber would dry in half the time.

The pans if used inside the rubber shed should be placed above the rubber, moist air being lighter than dry.

A still more efficient system would be to devise a circulation of dry air in the chamber and if this system were adopted it would be best to dry the air before blowing it with fans into the chamber. This could be easily done by causing it to pass over a series of iron pans of calcium chloride contained in a drying box outside.

The practical details of arrangement of course are easily worked out, I can give sketches to any who intend setting up such chambers shewing a good if not the best possible arrangements.

There are then two chief objections to the method of preparation as at present adopted; the first is that a considerable weight of mother liquor is retained by the freshly coagulated latex and in the rolled biscuits, and while the watery part of the liquor is dried out the impurities present in solution in that liquor remain; the second is in the mode of drying the biscuits—if dried in the open air there is much putrefaction and development of mould, if heat be used the rubber suffers in nerve. The remedy for the first objection—adopting the present method of making biscuits and pressing them will be to freely dilute the latex with water before coagulating, thus lessening the concentration of solid matter retained in solution in the water that is not pressed out of the biscuits. The difficulty in drying can best be met by the use of calcium chloride as an artificial drier.

So far I have treated the subject from two points of view—the first is the scientific if somewhat academic consideration of the latex itself; the second is a practical criticism of the faults inherent in the methods of preparation now in use and suggestions how to improve them. But along these lines there cannot, I think, be much further progress. The samples of rubber exhibited at the Show left little or nothing to be desired; they were clean, dry, elegant preparations, but when one considers the labour of preparation, each sheet being separately made by hand, the time taken before the sheets are ready to pack and in general the finicking nature of the work one feels that such methods can only be possible on a small scale and in the early stage of an industry. If there were no alternative nothing more could be said but one would have to be content to continue as before, and multiply labour, space and wasted time as the estates came into fuller bearing. But there fortunately is a simple and effective method of preparing rubber which yields a product which is more valuable to the manufacturer and which is easier to make than the neat small transparent sheets prepared at present.

The rubber sheets as exported at present are not in a condition fit for the manufacturer's use. The first thing that must always be done with them is to break them between steel rollers, wash, tear to pieces, re-combine, and then dry them. This is effected by means of a rubber washing machine which in essential consists of two steel rollers revolving on one another at different speeds. The rubber passing through is torn to pieces, a jet of water playing on it all the time. The fragments rejoin and finally a crinkled sheet porous and in some degree resembling crêpe work is produced. This when dry is ready for further use by the manufacturer and is known technically as washed rubber.

It was, I believe, Dr. CARL OTTO WEBER who first suggested the application of such a machine in the preparation of rubber direct from the latex in the case of Castilloa which is otherwise more troublesome to prepare than Para rubber.

The suggestion had been made that a similar machine could be used for Para rubber and from drawings supplied by Mr. PEARS, an experimental machine was constructed by the Federated Engineering Company under the supervision of Mr. RUSSELL, and it was this machine which was to be seen at work at the Show.

At the demonstration samples of washed rubber prepared by the manufacturer in England from crude imported rubber were shewn and rubber in similar form but of better colour was prepared by the machine from freshly coagulated latex, proving that the machine was capable of producing rubber in a form fit for direct use by the manufacturers.

The most striking demonstration of the use of the machine was made on a subsequent occasion in the presence of the Resident-General as follows:—

A milk can containing two or three gallons of freshly collected

latex was obtained, the latex was coagulated in less than five minutes by adding acetic acid and stirring. The coagulated mass was picked out, squeezed together by hand and thrown on to the machine, and after passing through the rollers a number of times it was converted into rolled and washed sheets which were dried in less than three days in the open air. With a calcium chloride drying chamber and using dried air they could have been dried and ready to pack in 48 hours.

But the use of a washing machine driven by an engine is not by any means confined to freshly coagulated latex. In dealing with scrap and dirty rubber its efficiency is very marked. The scrap is cleaned, machanical impurities are ejected, dirt and mud are washed away and the scrap is finally turned out in a form precisely similar to that taken by the first class rubber, and in a state of purity which is only a trifle inferior to it. With rubber from Ficus elastica or Rambong the machine deals in a similar manner, and an easy and simple method of treatment of this hitherto intractable latex is made possible. Great difficulty has been found in dealing with rambong up to the present because it cannot be coagulated in sheets in the same way as can Para rubber. If, however, the thick latex be churned, beaten or violently shaken, it coagulates in a great lump, and to treat this lump in the old way, to dry and render it fit for export has been a matter of great difficulty and of many months. The lumps however may be treated at once with the washing machine and thin sheets produced, which are clean and which rapidly dry without difficulty.

The use of machinery in dealing with latex and preparing marketable rubber is, I am convinced, a necessity and the almost universal adoption of it on rubber plantation of any size is only a matter of time. At present the trouble and labour involved in preparing "biscuits" by hand has scarcely made itself felt simply because so little rubber has been prepared.

In the immediate future this will be changed, for each pound of rubber hitherto prepared there will be fifty, and some change in the system of preparation to cope with this increased output will be a necessity. At present a form of rubber is prepared—the biscuit—which can only be regarded as a transition type. It must be remembered that all rubber has sooner or later to pass through the washing machine, it has to be made into crepe work or washed rubber.

To pass from the latex to this washed rubber through the biscuit form is taking one step down and then one and a half steps up. The same result can be obtained by one single process, by the use of a washing machine on the latex directly it is coagulated and the labour and trouble is only half a step compared to that involved in making fine "biscuits."

The widespread adoption of this mechanical method of treating rubber will be a very distinct step in the advance towards scientific rubber growing and preparation, and the debt which the whole of

the Malay Peninsula owes to Mr. RUSSELL and the Federated Engineering Company for the time, trouble and money that was spent in making a machine for exhibition—the first of its kind ever seen in this part of the world—must not be overlooked.

Without it words would have been weak, I fear futile. seeing is and was believing.

APPENDIX I.

THE RUBBER-WASHING MACHINE.

This machine consists essentially of two steel rollers which revolve on horizontal axes parallel to one another, the distance between the surfaces of the two rollers can be adjusted and varies from $\frac{3}{4}$ inch to practical contact.

The rollers revolve at different speeds and are driven by power transmitted from belt and pulley, through gear wheels to the rollers themselves.

The axes of the two rollers may be on the same horizontal plane, more usually one is slightly above the other, a stream of water flows over the surfaces of the rollers all the time they are in use.

When the machine is used, freshly coagulated lumps of rubber are put between the rollers, which are separated about $\frac{1}{4}$ inch. The rubber is passed through several times, the rollers being gradually approximated to each other—and the rubber becomes compacted and to some degree hardened. At the same time the effect of the differential rate of movement of the two roller surfaces is to subject the rubber to a shearing stress, which stretches and tears it to pieces, and it is here that the peculiar property of rubber is clearly seen. The elastic stretching and rebound, kick out any gross mechanical impurity that may be present, and when the machine is used on scrap rubber there is a perfect shower of dirt, pieces of bark and wood thrown out from the front of the machine. Freshly cut or torn surfaces of rubber re-unite on contact and pressure, for this reason the fragments into which the rubber is torn by the machine re-unite and emerge as a continuous sheet. At the same time the stream of water thoroughly washes out any impurity soluble in water that may be left in the rubber. The final product is a coherent but granular sheet of rubber, the thickness of which can be regulated by the distance left between the rollers. The function of the machine is thus threefold :—

Firstly it ejects mechanically any solid impurity ;

Secondly it breaks up the rubber and subjects all portions of the rubber to the washing effect of flowing water ;

Thirdly it produces granular thin sheet of uniform thickness which is clean and which can easily and rapidly be dried.

APPENDIX II.

The interests at stake are so great that I may be permitted perhaps to put in condensed form the advantages of the use of a washing machine in preparing rubber:—

1. The rubber produced will be as pure as it possibly can be without costly chemical treatment.

2. The rubber being pure will be of uniform quality.

3. The rubber being washed will be ready for immediate use by the manufactures, it will therefore have an enhanced value from the manufacturers' point of view, and with open competition must command a higher price.

4. It will effect a saving of labour to the planter by eliminating the petty hand labour involved in coagulating rubber in small plates, rolling the sheets by hand and manipulation of the small biscuits produced.

5. There will be an enormous saving of time in drying the rubber, this will involve a saving of storage room and labour in looking after the rubber when drying.

6. There will be no possibility of putrefaction of rubber in drying or discoloration by the growth of mould, the substances which putrefy or which feed mould being eliminated.

7. The machines will clean and deal efficiently and economically with scrap.

8. Rubber from Ficus elastica can be prepared efficiently and economically.

9. The washed rubber can be turned out of any length or thickness required, it will be easier to handle and pack. It keeps better than the best of the biscuits prepared in the old way.

APPENDIX III.

The following objections have been made to the use of a rubber washing machine:—

1. The initial cost is considerable—against this must be balanced the direct saving of gear which is required in the coagulation and preparation of rubber in the biscuit form, and the indirect saving of time and money consequent on the advantages of using the machine.

2. The manufacturers will not appreciate the rubber in the washed state:—

   The answer to this lies in the fact that the manufacturers themselves turn all the rubber they buy into washed sheets, they more than any, know the value of washed rubber.

3. The middlemen will not appreciate the rubber in the washed state:

   The middlemen must follow eventually the lead of the manufacturers to whom they sell.

4. That the manufacturers possess their own machinery for washing rubber and will prefer to keep that process in their own hands:

   This argument is more subtle but on analysis is unsound. In the first place the rubber on which their machines are employed at present is jungle produce almost entirely; the amount of cultivated rubber being quite trivial in comparison. The export of washed rubber from plantations will not decrease the amount of crude rubber coming into the market, at any rate during the lives of the machines in use at present, and therefore as much employment for the manufacturers' washing machines will be provided in the future as in the past. Cultivated rubber will be an extra supply—it being ready washed will do away with the necessity for new washing machines being erected, but cannot throw out of employment those already in use. That rubber manufacturers will wish to keep this process in their own hands is, I consider, improbable—it is not in any way a secret or specialised branch of the manufacture, but is an additional labour forced upon them in preparation for the skilled, and special subsequent treatment.

5. That the enhanced value of the washed rubber will not lead to an increase in price. This is an untenable objection, open competition must adjust the price according to the value. Also it is on record that one of the biggest manufacturers in England has offered *2d* to *3d* above top market price for such washed Para rubber; this question is now being put before the manufacturers in England and a definite reply is shortly expected.

6. That the washed rubber may be wilfully adulterated and the manufacturer therefore will wish to keep the washing process under his own control: From a technical and scientific point of view this objection is unsound. The appearance of the rubber is sufficient proof of its having been washed, and any added impurity which cannot be detected on inspection must have been added before washing. If the washing on the plantation still leave that impurity in the rubber, washing in the manufactory would also leave it, and the manufacturer gains nothing by doing it himself. Again it is far easier to adulterate the "biscuits" than it is to adulterate washed sheet. Wilful adulteration will therefore if practised at all be practised on "biscuit" rather than on washed sheet.

MISCELLANEOUS.

NOTICES TO SUBSCRIBERS.

1. For the information of subscribers and others who wish to complete their series of Bulletins, notice is given that numbers 1, 7, 8 and 9, of the old Series (1891 to 1900) and Nos. 1, 8, 9 and 10, of New Series, Vol. I (1901-1902) have been reprinted and copies can be had by all whose subscriptions are paid up to date. The cost to others is 50 cents a number.

2. A very large number of subscriptions, even for last year, are yet unpaid although subscribers have received more than one notice of the delay in payment. As this entails a good deal of extra work on the staff, subscribers are asked to send in their subscriptions without delay. Attention is called to the rule that all subscriptions should be prepaid.

3. Subscribers changing their addresses are requested to give notice to the Editor.

4. Subscribers outside the Peninsula will in future be charged $3.50 per annum instead of $3 to cover postage.

Meteorological observers are asked to send in their returns to arrive before the 10th day of the following month, if possible, so as to be in time for going to press.

Rainfall for July, 1904 :—

Balik Pulau	...	Ins.	9·70
The Fort	...	,,	9·25
The Prison	...	,,	9·12
Government Hill	...	,,	9·00
Pulau Jerejak	...	,,	6·29
Lumut ...	...	,,	14·81
Pangkore ...	...	,,	12·03
Bruas ...	...	,,	7·80

M. E. SCRIVEN,
Assistant Surgeon,
Prison Observatory.

Penang, 8th August, 1904.

The attached Return of Rainfall for Penang and Province Wellesley for the previous month will show at a glance that August has certainly helped to increase our Annual Fall, and judging from the appearance of the present state of the weather, it looks as if September *threatens* to follow suit :—

Government Hill ...	Ins.	26·34	No. of days on which rain fell.	20
The Fort ...	,,	26·48	Do.	18
The Prison ...	,,	26·33	Do.	22
Balik Pulau ...	,,	24·32	Do.	15
Pulau Jerejak ...	,,	24·29	Do.	19
Lumut ...	,,	1·98	Do.	11
Pangkore ...	,,	3·57	Do.	6
Bruas ...	,,	6·61	Do.	8
Butterworth ...	,,	26·44	Do.	20
Bukit Mertajam ...	,,	14·70	Do.	16
Sungei Bakap ...	,,	11·00	Do.	16

M. E. SCRIVEN,

Assistant Surgeon,

Prison Observatory.

Penang, 8th September, 1904.

Export Telegram to Europe and America

For Fortnight ending 15th July, 1904.

Wired at 2 p. m. on 16th July, 1904.

					Tons.
10	Tin	Str.	Singapore & Penang	United Kingdom &/or	1,536
11	Do.	,,	Do.	U. S. A.	266
12	Do.	,,	Do.	Continent	485
13	Gambier	,,	Singapore	London	...
14	Do.	,,	Do.	Liverpool	220
15	Do.	,,	Do.	U. K. &/or Continent	120
16	Cube Gambier	,,	Do.	United Kingdom	30
17	Black Pepper	,,	Do.	Do.	10
18	Do.	,,	Penang	Do.	...
19	White Pepper	,,	Singapore	Do.	40
20	Do.	,,	Penang	Do.	...
21	Pearl Sago	,,	Singapore	Do.	10
22	Sago flour	,,	Do.	London	50
23	Do.	,,	Do.	Liverpool	1,100
24	Tapioca, Flake	,,	Singapore & Penang	United Kingdom	100
25	Do. Pearl	,,	Do.	Do.	260
26	Do. Flour	,,	Penang	Do.	...
27	Gutta Percha	,,	Singapore	Do.	30
28	Copra	,,	Singapore & Penang	Do.	...
29	Buffalo Hides	,,	Singapore	Do.	60
30	Pineapples	,,	Do.	Do.	cases 49,000
31	Gambier	,,	Do.	U. S. A.	170
32	Cube Gambier	,,	Do.	Do.	20
33	Black Pepper	,,	Do.	Do.	10
4	White Pepper	,,	Do.	Do	...

					Tons.
35	Black Pepper	Str.	Penang	U. S. A.	270
36	White Pepper	,,	Do.	Do.	60
37	Nutmegs	,,	Singapore & Penang	Do.	4
38	Flake & Pearl	,,	Do.	Do.	80
39	Pineapples	,,	Singapore	Do.	cases 4,000
40	Do.	,,	Do.	Continent	cases 750
41	Gambier	,,	Do.	S. Continent	90
42	Do.	,,	Do.	N. Continent	100
43	Cube Gambier	,,	Do	Continent	120
44	Tapioca Flake	,,	Singapore & Penang	Do.	80
45	Do. Pearl	,,	Do.	Do.	...
46	Copra	,,	Do.	Marseilles	1,500
47	Do.	,,	Do.	Odessa	...
48	Do.	,,	Do.	S. Continent	100
49	Do.	,,	Do.	N. Continent	600
50	Black Pepper	,,	Singapore	S. Continent	320
51	Do.	,,	Do.	N Continent	70
52	White Pepper	,,	Do.	S. Continent	20
53	Do.	,,	Do.	N. Continent	20
54	Do.	,,	Penang	S. Continent	10
55	Do.	,,	Do.	N. Continent	...
56	Black Pepper	,,	Do.	S. Continent	40
57	Do.	,,	Do.	N. Continent	...
58	Sago Flour	,,	Singapore	U. S. A.	...
59	Do.	,,	Do.	Continent	1,050
60	Do.	,,	Do.	Glasgow	...
61	Gambier	,,	Do.	Do.	...
62	Do.	,,	Do.	U. S. A.	...
63	Flake and Pearl	,,	Do.	Do.	...
64	Cube Gambier	,,	Do.	Do.	...
65	White Pepper	,,	Do.	Do.	...
66	Do.	,,	Penang	Do.	...
67	Pineapples	,,	Singapore	Do.	...
68	Gambier	,,	Do.	S. Continent	...
69	Copra	,,	Do.	Marseilles	...
70	Black Pepper	,,	Do.	S. Continent	...
71	White Pepper	,,	Do.	Do.	...
72	Black Pepper	,,	Do.	U. S. A.	...
73	Do.	,,	Penang	Do.	...

450 tons Gambier }
80 ,, Black Pepper } Contracts

Export Telegram to Europe and America.

For Fortnight ending 31st July, 1904.

Wired at 6.20 p. m. on 2nd August, 1904.

					Tons.
10	Tin	Str.	Singapore & Penang	United Kingdom &/or	1,776
11	Do.	,,	Do.	U. S. A.	255
12	Do.	,,	Do.	Continent	125
13	Gambier	,,	Singapore	London	...
14	Do.	,,	Do.	Liverpool	...
15	Do.	,,	Do.	U. K. &/or Continent	220
16	Cube Gambier	,,	Do.	United Kingdom	...
17	Black Pepper	,,	Do.	Do.	20
18	Do.	,,	Penang	Do.	20

					Tons.
19	White Pepper	Str.	Singapore	United Kingdom	130
20	Do.	,,	Penang	Do.	...
21	Pearl Sago	,,	Singapore	Do.	70
22	Sago Flour	,,	Do.	London	300
23	Do.	,,	Do.	Liverpool	...
24	Tapioca Flake	,,	Singapore & Penang	United Kingdom	60
25	Do. Pearl	,,	Do.	Do.	110
26	Do. Flour	,,	Penang	Do.	140
27	Gutta Percha	,,	Singapore	Do.	40
28	Copra	,,	Singapore & Penang	Do.	...
29	Buffalo Hides	,,	Singapore	Do.	20
30	Pineapples	,,	Do.	Do.	cases 12,000
31	Gambier	,,	Do.	U. S. A.	1,150
32	Cube Gambier	,,	Do.	Do.	20
33	Black Pepper	,,	Do.	Do.	30
34	White Pepper	,,	Do.	Do.	90
35	Black Pepper	,,	Penang	Do.	...
36	White Pepper	,,	Do.	Do.	...
37	Nutmegs	,,	Singapore & Penang	Do.	25
38	Flake and Pearl	,,	Do.	Do.	530
39	Pineapples	,,	Singapore	Do.	cases 10,250
40	Do.	,,	Do.	Continent	cases 750
41	Gambier	,,	Do.	S. Continent	100
42	Do.	,,	Do.	N. Continent	80
43	Cube Gambier	,,	Do.	Continent	20
44	Tapioca Flake	,,	Singapore & Penang	Do.	310
45	Do. Pearl	,,	Do.	Do.	450
46	Copra	,,	Do.	Marseilles	640
47	Do.	,,	Do.	Odessa	...
48	Do.	,,	Do.	S. Continent	...
49	Do.	,,	Do.	N. Continent	300
50	Black Pepper	,,	Singapore	S. Continent	10
51	Do.	,,	Do.	N. Continent	40
52	White Pepper	,,	Do.	S. Continent	20
53	Do.	,,	Do.	N. Continent	120
54	Do.	,,	Penang	S. Continent	10
55	Do.	,,	Do.	N. Continent	100
56	Black Pepper	,,	Do.	S. Continent	30
57	Do.	,,	Do.	N. Continent	...
58	Sago Flour	,,	Singapore	U. S. A.	700
59	Do.	,,	Do.	Continent	50
60	Do.	,,	Do.	Glasgow	200
61	Gambier	,,	Do.	Do.	...
62	Do.	Str.	Do.	U. S. A.	...
63	Flake and Pearl	,,	Do.	Do.	...
64	Cube Gambier	,,	Do.	Do.	...
65	White Pepper	,,	Do.	Do.	...
66	Do.	,,	Penang	Do.	...
67	Pineapples	,,	Singapore	Do.	...
68	Gambier	,,	Do.	S. Continent	...
69	Copra	,,	Do.	Marseilles	...
70	Black Pepper	,,	Do.	S. Continent	...
71	White Pepper	,,	Do.	Do.	...
72	Black Pepper	,,	Do.	U. S. A.	...
73	Do.	,,	Penang	Do.	...

500 tons Gambier } Contracts.
200 ,, Black Pepper }

Penang.

Abstract of Meteorological Readings in the Prison Observatory for the month of July, 1904.

DISTRICT.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
	Ins.	°F	°F	°F	°F	°F	°F	°F	%	%		Ins.	Ins.
Criminal Prison Observatory	29·881	143·6	80·0	89·1	73·4	15·7	75·1	·779	70·35	70	N.W.	9·12	2·21

Colonial Surgeon's Office,

Penang, 8th August, 1904.

T. C. MUGLISTON,

Colonial Surgeon, Penang.

Malacca.

Abstract of Meteorological Readings for the month of July, 1904.

DISTRICT.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
	Ins.	°F	°F	°F	°F	°F	°F	°F	%	%		Ins.	Ins.
Durian Daun Hospital ...	29·831	161·8	79·3	90·0	70·4	19·6	81·2	10·70	72·0	95	S.E.	5·91	2·70

F. B. CROUCHER,

Colonial Surgeon, Malacca.

Colonial Surgeon's Office,

Malacca, 19th August, 1904.

Perak.

Abstract of Meteorological Readings in the various Districts of the State for the month of July, 1904.

DISRICT.	Maximum in Sun.	Temperature.				Hygrometer.			Total Rainfall	Greatest rainfall during 24 hours.
		Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Humidity.		
Taiping ...	151	82·64	93	70	23	76·67	838	77	12·37	5·83
Kuala Kangsar ...	...	80·78	93	70	21	75·29	804	76	5·28	1·73
Batu Gajah ...	159	81·12	93	69	25	76·27	844	79	5·50	2·02
Gopeng ...	...	81·17	93	63	29	75·65	813	76	5·48	2·56
Ipoh ...	...	82·25	92	72	18	77·90	899	82	5·08	1·49
Kampar ...	...	...	94	67	...	...	...	...	9·66	2·44
Teluk Anson ...	...	81·66	92	69	21	76·83	858	80	4·53	1·69
Tapah ...	..	80·61	93	65	28	75·13	798	76	8·93	2·47
Parit Buntar ...	...	82·23	93	70	20	77·23	868	79	4·00	1·37
Bagan Serai ...	...	81·25	91	70	20	75·94	828	78	5·59	1·30
Selama ...	...	81·91	91	71	19	77·18	869	80	5·58	1·02

STATE SURGEON'S OFFICE,

Taiping, 11th August, 1904.

M. J. WRIGHT,

State Surgeon, Perak.

Selangor.

Abstract of Meteorological Readings in the various Districts of the State for the month of July, 1904.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
General Hospital, Kuala Lumpur	29·878	145·8	80·3	89·7	71·8	17·9	75·7	0·806	72·5	77	Calm.	6·49	3·44
Pudoh Gaol Hospital ,, ...	...	...	...	...	...	...	...	...	...	...	...	7·88	2·60
District Hospital ,, ...	...	...	...	...	...	...	...	...	...	...	...	6·27	1·55
,, Klang	...	...	88·2	71·9	16·3	...	...	...	...	...	...	5·33	1·77
,, Kuala Langat	...	...	86·9	70·2	16·5	...	...	...	...	...	...	4·68	1·33
,, Kajang	...	...	91·7	70·9	20·8	...	...	...	...	...	...	6·39	2·02
,, Kuala Selangor	...	...	86·9	75·3	11·6	...	...	...	...	...	...	7·75	3·81
,, Kuala Kubu	...	...	91·6	71·3	20·1	...	...	...	...	...	...	10·98	3·33
,, Serendah	...	...	...	...	...	...	...	...	...	...	...	13·00	3·89
,, Rawang	...	...	85·5	72·6	12·9	...	...	...	...	...	...	11·30	2·40
Beri-beri Hospital, Jeram	...	...	...	...	...	...	...	...	...	...	...	7·22	3·98
Sabah Bernam	...	...	...	...	...	...	...	...	...	...	..	4·55	2·09
Ulu Gombah	...	...	...	...	...	...	...	...	...	...	...	7·71	2·32

State Surgeon's Office,
Kuala Lumpur, 17th August, 1903.

E. A. O. TRAVERS,
State Surgeon, Selangor.

Pahang.

Abstract of Meteorological Readings in the various Districts of the State for the month of July, 1904.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
Kuala Lipis ...	...	...	...	92·0	68·0	19·09	...	...	...	...	...	4·54	·95
Raub ...	...	...	...	91·0	67·0	19·87	...	...	...	...	...	3·69	1·24
Bentong ...	...	...	...	92·0	66·0	15·81	...	...	...	...	...	4·94	·98
Pekan ...	...	...	...	96·0	70·0	18·57	...	...	...	...	...	4·48	1·20
Sungei Lembing ...	...	...	...	89·0	66·0	23·00	...	...	...	...	...	2·66	0·62
Kuantan ...	...	...	...	84·0	74·0	10·00	...	...	...	...	...	8·05	1·90

Kuala Lipis,
20th August, 1904.

Kelantan.

Abstract of Meteorological Readings in Kelantan for the month of July, 1904.

District.	Temperature.			Rainfall.	
	Mean Maximum.	Mean Minimum.	Mean Range.	Total Rainfall.	Greatest Rainfall during 24 hours.
	°F	°F	°F	Inches.	Inches.
Kuala Lebir ...	89.5	70.7	18.8	11.13	2.04

The Maximum temperature registered was 93·0 °F; the Minimum 84·0 °F.

Kuala Lebir, 6th August, 1904.

JOHN D. GIMLETTE.

Singapore.

Abstract of Meteorological Readings for the month of August, 1904.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
	Ins.	°F.	°F.	°F.	°F.	°F.	°F.	Ins.	°F	%		Ins.	Ins.
Kandang Kerbau Hospital Observatory … …	29·908	138·4	79·7	88·0	71·9	16·1	77·3	·872	75·6	80	S.W.	12·38	2·25

A. B. LEICESTER,
Meteorological Observer.

W. GILMORE ELLIS,
Acting Principal Civil Medical Officer, S.S.

Kandang Kerbau Hospital Observatory,
Singapore, 9th September, 1904.

Penang.

Abstract of Meteorological Readings in the Prison Observatory for August, 1904.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew point.	Humidity.			
	Ins.	°F	°F	°F	°F	°F	°F	°F	%	%		Ins.	Ins.
Criminal Prison Observatory	29·885	141·4	79·7	88·7	73·2	15·5	76·2	·789	72·4	73	S.	26·33	4·37

Colonial Surgeon's Office,

Penang, 5th September, 1904.

M. E. SCRIVEN,

Assistant Surgeon.

T. C. MUGLISTON,

Colonial Surgeon, Penang.

Malacca.

Abstract of Meteorological Readings for the month of August, 1904.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
	Ins.	°F	°F	°F	°F	°F	°F	Ins.	°F	%		Ins.	Ins.
Durian Daun Hospital	29·840	162·4	79·0	90·6	70·1	19·7	80·8	11·28	70·1	95	S.E.	6·83	1·39

Colonial Surgeon's Office,

Malacca, 14th September, 1904.

F. B. CROUCHER,

Colonial Surgeon, Malacca.

Perak.

Abstract of Meteorological Readings in the various Districts of the State for the month of August, 1904.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
Taiping ...	...	149	82·41	94	69	23	76·41	830	...	75	...	7·99	2·00
Kuala Kangsar ...	...	...	80·01	92	69	22	75·36	819	...	81	...	7·60	2·15
Batu Gajah ...	...	159	80·50	93	69	21	76·66	867	...	83	...	9·34	3·32
Gopeng ...	...	...	80·45	94	63	29	75·33	810	...	78	...	5·08	·99
Ipoh ...	...	...	81·69	92	72	19	77·18	873	...	81	...	3·82	·87
Kampar ...	...	...	...	94	67	25	...	...	...	...	..	3·87	·94
Teluk Anson ...	...	...	82·52	92	69	22	76·81	855	...	77	...	3·75	1·31
Tapah ...	...	...	81·08	93	66	24	75·42	805	...	76	...	4·40	2·21
Parit Buntar ...	...	...	81·47	92	70	20	76·93	868	...	81	...	11·63	2·17
Bagan Serai ...	...	...	81·19	91	69	20	75·97	828	...	78	...	11·48	2·88
Selama ...	...	...	81·07	91	71	16	76·71	862	...	82	...	12·70	1·50

State Surgeon's Office,
Taiping, 10th September, 1904.

M. J. WRIGHT,
State Surgeon.

Selangor.

Abstract of Meteorological Readings in the various Districts of the State for the month of August, 1904.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
General Hospital, Kuala Lumpur	29·861	150·0	77·6	88·9	70·9	17·9	75·0	0·828	73·8	81	Calm.	6·19	2·32
Pudoh Gaol Hospital, ,, ...	...	...	...	...	...	...	...	...	...	...	...	4·10	0·90
District Hospital, ,, ...	...	...	...	...	...	...	...	...	...	...	...	3·35	1·00
,, Klang	...	...	...	88·5	71·8	16·7	...	...	...	...	...	3·10	0·68
,, Kuala Langat	...	...	...	87·1	71·3	15·8	...	...	...	...	...	4·54	1·40
,, Kajang	...	...	...	91·7	71·9	20·0	...	...	...	...	...	6·57	2·05
,, Kuala Selangor	...	...	...	86·7	75·0	11·7	...	...	...	...	...	2·65	0·98
,, Kuala Kubu	...	...	...	91·8	71·4	20·4	...	...	...	...	...	3·51	0·83
,, Serendah	...	...	...	...	...	...	...	...	...	...	...	3·82	1·38
,, Rawang	...	...	...	85·8	73·3	12·5	...	...	...	...	...	4·08	1·55
Beri-beri Hospital, Jeram	...	...	...	...	...	...	...	...	...	...	...	3·19	0·79
Sabah Bernam	...	...	...	...	...	...	...	...	...	...	...	1·46	0·45
Ulu Gombah	...	...	...	...	...	...	...	...	...	...	...		
												3·83	1·38

State Surgeon's Office,

Kuala Lumpur, 16th September, 1904.

E. A. O. TRAVERS,

State Surgeon, Selangor.

Pahang.

Abstract of Meteorological Readings in the various Districts of the State for the month of August, 1904.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum n Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
Kuala Lipis ...	...	...	...	93·0	67·0	19·55	...	...	...	...	...	3·25	·66
Raub ...	..	...	...	93·0	66·0	20·29	...	...	...	...	...	2·80	·80
Bentong ...	...	...	...	93·0	70·0	15·62	...	...	...	...	...	5·81	2·15
Pekan ...	...	...	...	94·0	70·0	17·50	...	...	...	...	...	8·23	2·88
Sungei Lembing ...	...	...	...	91·0	64·0	27·00	...	...	...	...	...	5·93	1·08
Temerloh ...	...	...	...	94·0	70·0	24·00	...	...	...	...	N.W.	6·26	1·06

S. LUCY,

State Surgeon, Pahang.

KUALA LIPIS,

30th September, 1904.

Muar.

Abstract of Meteorological Readings in Muar for the month of August, 1904.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
Lanadron Estate ...	...	...	83°	91°	71°	20°	74°	...	...	...	...	4·20	1·43

Muar, 3rd September, 1904.

ROGER PEARS.

Kelantan.

Abstract of Meteorological Readings in Kelantan for the month of August, 1904.

District.	Temperature.			Rainfall.	
	Mean Maximum.	Mean Minimum.	Mean Range.	Total Rainfall.	Greatest Rainfall during 24 hours.
	°F	°F	°F	Inches.	Inches.
Kuala Lebir ...	89·5	70·4	19·1	6·39	·91

Kuala Lebir, 4th September, 1904.

JOHN D. GIMLETTE.

METEOROLOGICAL OBSERVATIONS.

Table Showing the Daily Results of the Reading of Meteorological Observations taken at the General Hospital, Seremban, for the Month of June, 1904.

Date.	Temperature of radiation.						Temperature of radiation.				Wind. Direction.		Temperature of evaporation.			Computed vapour tension.			Relative humidity.			Clouds 0 to 10.			Cloud and weather initials.			Rain.
	9 H	15 H	Mean.	Maximum.	Minimum.	Range.	Sun.	Difference sun and shade.	Grass.	Difference shade and radiation.	9 H	15 H	9 H	15 H	Mean.	9 H	15 H	Mean.	9 H	15 H	Mean.	9 H	15 H	21 H	9 H	15 H	21 H	Inches.
	°	°	°	°	°	°	°	°	°	°			°	°		in.	in.											
1	82	85	83.5	86	71	15	150	64	66	5	N.W.	S.	75.3	78.4	78.8	0.877	0.973	0.925	80	80	80	0	0	0	B	B	B	
2	82	83	82.5	87	71	16	160	73	66	5	N.W.	S.	75.3	76.3	75.8	.877	.905	.891	80	80	80	0	0	0	B	B	B	
3	82	83	82.5	88	71	17	160	72	66	5	N.W.	S.E.	75.3	76.3	75.8	.877	.905	.891	80	80	80	0	0	0	B	B	B	
4	82	84	83	88	71	17	165	77	65	6	N.E.	S.E.	75.3	79	77.1	.877	.990	.933	80	85	82.5	0	0	0	B	B	B	
5	81	84	82.5	88	71	17	160	72	66	5	N.E.	S.E.	74.2	79	76.6	.849	.990	.919	80	85	82.5	0	0	0	B	B	B	
6	81	85	83	89	71	18	160	71	66	5	S.E.	S.	74.2	78.4	76.3	.849	.973	.911	80	80	80	0	0	0	B	B	B	
7	82	85	83.5	89	71	18	160	71	66	5	S.E.	S.	75.3	78.4	76.8	.877	.973	.925	80	80	80	0	0	0	B	B	B	
8	82	85	83.5	88	71	17	160	72	66	5	S.E.	S.	75.3	78.4	76.8	.877	.973	.925	80	80	80	0	0	0	B	B	B	
9	82	85	83.5	88	71	17	160	72	66	5	S.W.	S.E.	75.3	78.4	76.8	.877	.973	.925	80	80	80	0	10	0	B	R	B	
10	82	84	83	89	71	18	160	71	66	5	S.W.	S.E.	75.3	79	77.1	.877	.990	.933	80	85	82.5	0	0	2	B	B	B	
11	82	85	83.5	88	71	17	160	72	66	5	S.E.	S.E.	75.3	78.4	76.8	.877	.973	.925	80	80	80	0	0	2	B	B	B	
12	81	82	81.5	88	71	17	160	72	66	5	S.W.	S.	76.2	80.3	78.2	.897	1.033	.965	85	95	90	0	2	2	B	B	B	
13	81	82	81.5	87	71	16	150	63	66	5	S.W.	S.	76.2	77	76.6	.897	0.926	.911	85	85	85	0	0	0	B	B	B	
14	81	81	81	87	71	16	150	63	66	5	S.E.	E.	76.2	76.2	76.2	.897	.897	.897	85	85	85	0	0	0	B	B	B	
15	82	83	82.5	88	71	17	155	67	66	5	S.	S.E.	75.3	76.3	75.8	.877	.905	.891	80	80	80	0	0	0	B	B	B	
16	79	78	78.5	82	71	11	130	48	66	5	S.	S.E.	77.3	78	77.6	.937	.958	.947	95	100	97.5	5	10	5	C	R	C	1.10
17	82	81	81.5	85	71	14	135	50	66	5	S.E.	S.E.	75.3	76.2	75.7	.877	.897	.887	80	85	82.5	0	2	2	B	B	B	.20
18	81	82	81.5	88	71	17	150	62	66	5	S.E.	S.	74.2	75.3	74.7	.849	.877	.863	80	80	80	0	0	0	B	B	B	
19	77	75	76	79	71	8	85	6	65	6	S.E.	S.	73.6	75	74.3	.829	.868	.848	89	100	94.5	5	10	10	C	R	R	1.
20	80	80	80	82	71	11	110	28	65	6	S.E.	S.	75	75	75	.867	.867	.867	85	85	85	2	2	0	B	B	B	
21	83	83	83	87	71	16	150	63	65	6	S.E.	S.	79.7	79.7	79.7	1.010	1.010	1.010	90	90	90	0	0	0	B	B	B	
22	83	84	83.5	87	71	16	150	63	65	6	S.E.	S.	79.7	80.7	80.2	1.010	1.045	1.027	90	90	90	0	0	0	B	B	B	
23	82	84	83	88	71	17	150	62	65	6	S.E.	S.	75.3	80.7	78	0.877	1.045	0.901	80	90	85	0	0	0	B	B	B	
24	82	82	82	88	71	17	150	62	66	5	S.E.	S.	75.3	77	76.1	.877	0.926	.901	80	85	82.5	0	0	0	B	B	B	
25	82	84	83	89	71	18	150	61	66	5	S.E.	S.	75.3	79	77.1	.877	.990	.933	80	85	82.5	0	0	0	B	B	B	
26	80	82	81	89	70	19	150	61	66	4	S.E.	S.	75	75.3	75.1	.867	.877	.872	85	80	82.5	2	0	0	B	B	B	
27	80	80	80	87	69	18	140	53	65	4	S.E.	S.	75	75	75	.867	.867	.867	85	85	85	2	2	2	B	B	B	
28	80	82	81	89	69	20	150	61	65	4	E.	E.	75	75.3	75.1	.867	.877	.872	85	80	82.5	2	0	0	B	B	B	
29	80	80	80	87	72	15	130	43	65	7	E.	E.	75	75	75	.867	.867	.867	85	85	85	2	2	0	B	B	B	
30	80	82	81	88	71	17	150	62	65	6	S.E.	E.	75	77	76	.867	.926	.896	85	85	85	2	0	0	B	B	B	

Total 2.30

STATE SURGEON'S OFFICE.
Seremban, 15th July, 1904.

J. SHEPLEY PART, M.D.,
Acting State Surgeon.

No. 9.] SEPTEMBER, 1904. [Vol. III.

AGRICULTURAL BULLETIN

OF THE

STRAITS

AND

FEDERATED MALAY STATES

EDITED BY

H. N. RIDLEY, M. A., F. L. S.,

Director of Botanic Gardens, S. S.

CONTENTS.

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NOTICE.

The Scientific and Technical Departments of the Imperial Institute.

His Excellency the Governor has received a despatch from the Right Hon'ble the Secretary of State for the Colonies calling attention to the advantages offered by the Imperial Institute to Merchants, Planters and others, who may wish to have samples submitted to scientific experts for opinion as to their commercial value, &c. The following extracts from a Memorandum published by the Authorities of the Imperial Institute will give an idea of the work undertaken and carried on there.

"The Scientific and Technical Department of the Institute has "been established to acquire information by special enquiries and "by experimental research, technical trials and commercial valua-"tion regarding new or little known natural or manufactured pro-"ducts of the various Colonies and Dependencies of the British "Empire and of Foreign Countries, and also regarding known "products procurable from new sources, and local products of "manufacture which it is desired to export. This work is carried "out with a view to the creation of new openings in trade, or the "promotion of industrial developments."

2. In an extensive and well equipped series of Research Laboratories, a numerous staff of skilled chemists under the direction of Professor Wyndham R. Dunstan, M.A., F.R.S., carry out the investigation of the chemical constitution and properties of new dye-stuffs, tanning materials, seeds and food-stuffs, oils, gums and resins, fibres, timbers, medicinal plants and products, with a view to their commercial utilization. Whenever necessary these materials are submitted to special scientific experts, by whom they are made the subject of particular investigation or practical tests. Reports are also obtained from technical or trade experts in regard to the probable commercial or industrial value of any such products, while full information is collected from official or other trustworthy sources regarding the probable extent and cost of available supplies.

Reports on the results of enquiries or experimental investigations are supplied as a rule, without charge, but should special expenses be incurred in connection with any such reports, or with the commercial value of particular materials or manufactured products, which the Council do not consider themselves warranted in meeting, a statement of such outlays will be furnished, for repayment, when the Reports are supplied. Should an investigation or report of exceptional character be asked for by a Government Department, an estimate of the attendant expenses will be submitted, with a view to ascertain whether authority for such expenditure will be given.

3. The Federated Malay States Government has undertaken to grant a sum of £100 a year for 5 years to the Department with a view to the careful investigation and commercial development of the mineral resources of the States.

The Government Geologist is collecting specimens for chemical examination and after analysis the Imperial Institute which is in very complete touch with the principal manufacturing and other industries of the United Kingdom, will bring the specimens before manufacturers and others for trial with a view to their commercial development.

It is expected that this action will do much to help in finding a market for new products and developing the markets for those already exploited.

AGRICULTURAL BULLETIN

OF THE

STRAITS

AND

FEDERATED MALAY STATES.

No. 9.] SEPTEMBER, 1904. [VOL. III.

EXPERIMENTAL TAPPING OF PARA RUBBER TREES AT THE BOTANIC GARDENS, SINGAPORE.

An account of the history of the Para Rubber trees growing in the Singapore Gardens will be found in Bulletin, January 1903, p. 2 (Vol. II No. 1) and the following brief notes and results on the work now being carried on may be of interest as shewing the nature and progress of the experiments.

It is intended to experiment on about 1,280 seedling trees, which were planted in 1886, 1887 and 1888 on very swampy land. The outside rows were planted first, and are much the finest trees averaging 4½ feet against 2½ girth (at 3 feet from the ground) for the inside trees. The distance of the inside trees, however, has not been uniform and in some clumps is only 6 feet apart, and in none more than 15 feet—excepting vacancies not supplied.

So far as the experiments have gone the comparative yield by different methods of tapping has been attempted only, and from our own experiments, we expect to find the best one for giving the best results. Of the methods tried the single incision differs from all others in respect of flow of latex, *i.e.* with single incisions started, say, 6 feet from the ground, the flow of latex increases with each tapping as the tappings approach to the base of the tree, and the latter tappings may be as good, if not the best of all. The result however, has not been generally satisfactory.

With the herring-bone incisions, and its modifications, as is well known, the flow of latex increases from a little to a maximum yield and then gradually decreases. But the yield of trees varies from scanty to copious, and whichever method is adopted the tapping is affected by rain and excessive moisture. There is also a difference in the composition of latex from trees of different sizes, *e.g.* the same quantity of latex gives a much thicker biscuit of prepared Rubber from a big tree than a small one, irrespective of age. Very probably a big tree is capable of transpiring excessive moisture quicker.

These experiments favour morning over evening tappings, although our evening work commenced as late in the day as possible, starting about 5 o'clock, and for this discrepancy, or rather the effect produced on the flow of latex, there is a very good reason which I fancy, has been overlooked. From a series of tests and measurements I conclude there can be no doubt that the flow of latex depends entirely on the pressure of water, *and the contraction and expansion of a tree during the course of the day is considerable.* A tree of 3 feet girth at 3 feet from the ground, measuring exactly 3 feet at 6 A.M. would by afternoon, according to the brightness of the day, contract to a maximum of ½ inch, and by 6 P.M. or soon afterwards expand to early morning measurement. Or, if a ligature be fixed tightly on a tree it can be observed that in the early morning the ligature is fully stretched, and by afternoon, if a bright warm day, is quite slack, or partly so, according to the day, and as the evening advances gradually braces up. On wet days the ligature is expanded, to tension point and the flow of latex is considerably increased, but contains a high percentage of water as is seen by the excessive residuum when the latex has coagulated. In wet weather it seems best to tap some hours after a storm, and to get the best result from evening tappings the work should be deferred as late in the day as possible.

Doubtless there is one method of tapping Para trees better than others, and the work that is being carried on in so many parts of the world should soon decide which is the one best suited for extracting the maximum yield of latex at the minimum risk of injury to the tree, but for a substantial increase in the yield of latex, I infer that improvement lies in the direction of a thorough knowledge of the requirements of the tree, and it may be necessary for planters to expand their ideas in respect of the distance apart trees should permanently stand, and to obtain a well developed tree which shows a satisfactory annual increment of growth, 30 feet apart is but a moderate and rational distance.

It will be seen that in a few instances, tappings have been continued for 18 times, and it will be noted that in nearly every instance the decrease below maximum yield amounted to very little. It appears that on big trees the scar does not increase at the same ratio as on small ones, and had a gross yield been attempted, several more tappings would have been obtained, and as might be expected the 2nd, 3rd and perhaps 4th tappings omitted, so that the 18th tapping would then have stood as the 15th. Of course there is a limit as to how wide a scar should be, but I have never seen a tree injured by removing an extravagant amount of bark, it is in the depth of the incision that risk of injury lies.

As to implements for tapping, we have used an ordinary pruning knife and a small ½ inch carpenter's chisel, which have answered the purpose very well. At the present time there are many implements for tapping and so long as it gives a clean cut the one that expedites the operation of tapping most should be the best. The 1½ inch carpenter's chisel for single incisions is not an implement

to be commended, as apart from the possibility of punching too deeply there is also the danger of raising the bark.

To cope against the partial coagulation of the latex in collecting cups, which sometimes came in in clots, and could not therefore be strained and represented so much scrap, we have used a very weak solution of Formalin, this does no harm and answers the purpose admirably.

Pending the completion of a drying chamber the difficulty of mould has been very troublesome, but a good deal of excellent "biscuit" has been prepared with the Calicium-Chloride process in almeirahs and cabinets.

R. DERRY.

Experiment I.

In this experiment the single incision comes out best, but each group so tapped were large and outside trees, and for large trees, gnarled and hard, the single incision will always be a convenient method.

The difference between morning and evening tappings is not conspicuous, a matter of 2 ozs. only, but the aggregate girths were morning 81′.3″ and evening 91′.3″ and also workman No. 4 spoiled his morning tappings the reversed oblique incisions being much too close, and with his evening tappings, single incisions, he had the luck with tree 27 which, in respect of yield, surpasses any other tree I have observed.

For the sake of uniformity, the experiment ceased as soon as the simple incisions were completed, and these, No. 5 morning and Nos. 4 and 5 evening, represent completed tappings.

The reversed oblique incision shows no advantage over oblique incisions and has not been continued.

Experiment I (Morning).

GROUPS OF 5 TREES.

Reg. No. of Tree.	Working Number.	Registered Girth at 3 feet from Ground.	Mode of Incision.	Date.	Amount. Ounces.	Times Tapped.	Total. Ounces.	Average Yield per Tree. Ounces.	Comparative Yield per inch of Girth.	Remarks.
				July.	*					
		Ft. in.		5	$\frac{1}{4}$					*Incision.*—The herring bone without centre channel and the incisions about an angle of 135° to the perpendicular.
				6	1					
8	I.	2 5	Long.	7	$\frac{3}{4}$					
16		2 $2\frac{1}{2}$	Oblique.	8	$2\frac{3}{4}$					
18		2 1	Reversed.	9	$2\frac{1}{2}$					
72		2 6		11	$2\frac{1}{4}$					
73		2 $1\frac{3}{4}$		12	$2\frac{1}{4}$					
				13	$2\frac{1}{2}$					
	Aggregate Girth ...	11 $4\frac{1}{2}$ †		14	$2\frac{1}{4}$					
				15	$1\frac{1}{2}$	15	$28\frac{1}{2}$	$5\frac{3}{5}$	Under $\frac{1}{4}$ ounce.	
				16	2					
				18	$1\frac{3}{4}$					
				19	$2\frac{1}{4}$					
				21	$2\frac{1}{2}$					
				22	2					

* Nearly dry Biscuit. † Each tree between 2 feet and 2 feet 6 inches in girth.

Experiment I (Morning).

GROUPS OF 5 TREES.

Reg. No. of Tree.	Working Number.	Registered Girth at 3 feet Ground	Mode of Incision.	Date.	Amount. Ounces.	Times Tapped.	Total. Ounces.	Average Yield per Tree. Ounces.	Comparative Yield per inch of Girth.	Remarks.
				July.	*					*Incision.*—The herring bone without centre channel. Incisions about angle of 45° to the perpendicular.
		Ft. in.		5	1					
				6	1½					
19		2 7½	Long.	7	2½					
20		2 11½	Oblique.	8	3					
21	II.	2 10¾		9	3½					
22		2 6¼		11	3¾					
25		2 11½		12	3					
				13	3¾					
	Aggregate Girth ...	13 11½ †		14	2½	15	43¾	8⅗	Over ¼ ounce.	
				15	3					
				16	3					
				18	3					
				19	3¾					
				21	3¾					
				22	2¾					

* Nearly dry Biscuit.

† Each tree between 2 feet 6 inches and 3 feet in girth.

Experiment I (Morning).

GROUPS OF 5 TREES.

Reg. No. of Tree.	Working Number.	Registered Girth at 3 feet from Ground.	Mode of Incision.	Date.	Amount. Ounces.	Times Tapped.	Total. Ounces.	Average Yield per Tree. Ounces.	Comparative Yield per inch of Girth.	Remarks.
				July.	*					
		Ft. in.		5	¾					
				6	1½					
15		3 2	Long	7	3					
17		3 3¼	Oblique	8	5					
29	III	3 2½	Reversed.	9	4½					
				11	4					
32		3 3¾		12	4					
34		3 3		13	3					
	Aggregate Girth ...	16 3 †		14	4½	15	59¼	11⅘	Over ¼ ounce.	
				15	5					
				16	4					
				18	4¾					
				19	5¼					
				21	6					
				22	4					

* Nearly dry Biscuit. † Each tree between 3 feet and 3 feet 6 inches in girth.

Experiment I (Morning).

GROUPS OF 5 TREES.

Reg. No. of Tree.	Working Number.	Registered Girth at 3 feet from Ground.	Mode of Incision.	Date.	Amount Ounces.	Times Tapped.	Total. Ounces.	Average Yield per Tree. Ounces.	Comparative Yield per inch of Girth.	Remarks.
				July.	*					
				5	$\frac{3}{4}$					
		Ft, in		6	1					
26		3 10	Long	7	$1\frac{1}{2}$					
31		3 $11\frac{1}{2}$	Oblique	8	$2\frac{3}{4}$					
33	IV.	3 8		9	2					
36		3 $7\frac{1}{2}$		11	3					
42		3 $7\frac{1}{2}$		12	3					
				13	$3\frac{1}{4}$					
	Aggregate Girth ...	18 $8\frac{1}{2}$ †		14	$3\frac{1}{4}$	15	$40\frac{1}{4}$	8	Under $\frac{1}{4}$ ounce.	
				15	4					
				16	$3\frac{1}{2}$					
				18	$3\frac{1}{4}$					
				19	3					
				21	$3\frac{1}{2}$					
				22	$2\frac{1}{2}$					

* Nearly dry Biscuit. † Each tree between 3 feet 6 inches and 4 feet in girth.

Experiment I (Morning.)

GROUPS OF 5 TREES.

Reg. No of Tree.	Working Number.	Registered Girth at 3 feet from Ground.	Mode of Incision.	Date.	Amount, Ounces.	Times Tapped.	Total, Ounces.	Average Yield per Tree.	Comparative Yield per inch of Girth.	Remarks.
				July.	*			lbs. oz.		
		Ft. in.		5	1½					
10	V.	4 6	Single.	6	3½					
14		4 1	10 cups daily.	7	3¼					
				8	6½					
40		4 1¾		9	8					
41		4 0½		11	11½					
52		4 3½		12	9	15	131	1 7	Over ½ ounce.	
				13	11½					
	Aggregate Girth ...	21 0¾ †		14	11					
				15	13					
				16	13					
				18	9½					
				19	11½					
				21	10½					
				22	7¾					

* Nearly dry Biscuit. † Each tree between 4 feet and 4 feet 6 inches in girth.

Experiment I (Evening.)

GROUPS OF 5 TREES.

Reg. No. of Tree.	Working Nunmber.	Registered Girth at 3 feet from Ground.	Mode of Incision	Date.	Amount. Ounces.	Times Tapped.	Total Ounces.	Average Yield per Tree. Ounces.	Comparative Yield per inch of Girth.	Remarks.
				July.	*					
		Ft. in.		4	$\frac{1}{4}$					
6		1 $11\frac{1}{2}$	Long.	5	1					
12		1 $11\frac{1}{2}$	Oblique.	6	$\frac{1}{4}$					
67	1	1 10	Reversed.	7	2					
70		1 $8\frac{1}{4}$		8	$1\frac{1}{4}$					
71		1 $11\frac{1}{2}$		9	$1\frac{1}{4}$					
				11	$1\frac{1}{2}$	15	$19\frac{3}{4}$	4	Under $\frac{1}{4}$ ounce.	
	Aggregate Girth ...	9 $4\frac{3}{4}$ †		12	1 [illegible]					
				13	$1\frac{1}{2}$					
				14	$1\frac{3}{4}$					
				15	$2\frac{1}{2}$					
				16	1					
				18	$1\frac{1}{2}$					
				19	$1\frac{1}{4}$					
				20	$1\frac{1}{2}$					

* Nearly dry Biscuit. † Each tree under 2 feet in girth.

Experiment I (Evening.)

GROUPS OF 5 TREES.

Reg. No. Tree.	Working Number.	Registered Girth at 3 feet from Ground.	Mode of Inciision.	Date.	Amount. Ounces.	Times Tapped.	Total Ounces.	Average Yield per Tree. Ounces.	Comparative Yield per inch of Girth.	Remarks.
				July.	*					
				4	½					
		Ft. in.		5	1¾					
30	II	2 10	Long.	6	3¼					
46		2 11¼	Oblique.	7	2¼					
47		2 10¾		8	2¼					
48		2 10		9	3½					
63		2 11¼		11	3					
				12	1¾					
	Aggregate Girth ...			13	3¾					
		13 5¼ †		14	2½	15	36	7⅕	Under ¼ ounce.	
				15	2¼					
				16	2¼					
				18	2½					
				19	1¾					
				20	2¾					

* Nearly dry Biscuit. † Each tree between 2 feet 6 inches and 3 feet in girth.

Experiment I (Evening).

GROUPS OF 5 TREES.

Reg. No. of Tree.	Working Number.	Registered Girth at 3 feet from Ground.	Mode of Incision.	Date.	Amount. Ounces.	Times Tapped.	Total. Ounces.	Average Yield per Tree. Ounces.	Comparative Yield per inch of Girth.	Remarks.
				July.	*					
		Ft. in.		4	$\frac{1}{4}$					
49		3 11	Long.	5	$\frac{1}{2}$					
50		3 7	Oblique	6	$1\frac{3}{4}$					
				7	$4\frac{1}{2}$					
58	III.	3 $8\frac{1}{4}$		8	$3\frac{1}{4}$					
68		3 10		9	$3\frac{1}{2}$					
86		3 7		11	$3\frac{1}{2}$					
	Aggregate Girth ...	17 $11\frac{1}{4}$ †		12	$3\frac{3}{4}$	15	$50\frac{1}{2}$	10	Under $\frac{1}{4}$ ounce.	
				13	$3\frac{3}{4}$					
				14	$5\frac{1}{2}$					
				15	$4\frac{1}{2}$					
				16	$3\frac{3}{4}$					
				18	$4\frac{1}{4}$					
				19	$3\frac{3}{4}$					
				20	4					

* Nearly dry Biscuit. † Each tree between 3 feet 6 inches and 4 feet in girth.

Experiment I (Evening).

GROUPS OF 5 TREES.

Reg. No. of Tree.	Working Number.	Registered Girth at 3 feet from Ground.	Mode of Incision.	Date.	Amount Ounces.	Times Tapped.	Total Ounces.	Average Yield per Tree. Ounces.	Comparative Yield per inch of Girth.	Remarks.
				July.	*					
		Ft. in.		4	½					
				5	¾					
3		4 7½	Single.	6	2					
4		4 9½	10 cups daily.	7	4½					
9	IV	4 8½		8	5½					
27		4 8¼		9	6½					
35		4 7¾		11	7¾					
				12	9½					
	Aggregate Girth ...	22 9½ †		13	8					
				14	9	15	100¼	1 lb. 4 oz.	Over ¼ ounce.	
				15	8½					
				16	8½					
				18	10					
				19	10					
				20	9¼					

* Nearly dry Biscuit. † Each tree between 4 feet 6 inches and 5 feet in girth.

Experiment I (Evening).

GROUPS OF 5 TREES.

Reg. No. of Tree.	Working Number.	Registered Girth at 3 feet from Ground.	Mode of Incision.	Date.	Amount. Ounces.	Times Tapped.	Total. Ounces.	Average Yield per Tree. Ounces.	Comparative Yield per inch of Girth.	Remarks.
				July	*					
				4	2					
		Ft. in.		5	$\frac{3}{4}$					
				6	1					
5		5 9	Single.	7	$3\frac{1}{4}$					
66		5 $7\frac{1}{4}$	10 Cups daily.	8	$5\frac{1}{2}$					
				9	$6\frac{1}{2}$					
356	V.	5 $10\frac{1}{2}$		11	$7\frac{3}{4}$					
357		5 $8\frac{1}{2}$		12	$9\frac{1}{2}$					
360		5 $10\frac{1}{4}$		13	8					
				14	9	15	$93\frac{3}{4}$	lb. 1. $2\frac{1}{2}$ oz.	Over $\frac{1}{4}$ ounce.	
	Aggregate Girth ...	28 $9\frac{1}{2}$ †		15	$8\frac{1}{2}$					
				16	7					
				18	$7\frac{3}{4}$					
				19	$8\frac{1}{4}$					
				20	9					

Total Mornings $302\frac{3}{4}$ ounces = 18 lbs. $14\frac{3}{4}$ ozs.

Total Evenings $300\frac{1}{4}$,, = 18 lbs. $12\frac{1}{4}$,,

* Nearly dry Biscuit. † Each tree between 5 feet 6 inches and 6 feet in girth.

Experiment II.

A very interesting experiment, the finest lot of trees was undoubtedly No. 3 morning, whose best tapping was 13 ounces and the 18th tapping 10 ounces. Single incisions comes out very poor and is in each group the lowest result.

After 14 tappings it was necessary to stop or the trees would have been scored too severely. It may be thought 10 cups on each tree were too many, I do not think so, *see* Experiment III, Number IV.

The advantage of tapping on alternate days is shewn in the difference between Nos. 1 and 2, both in morning and evening tappings. It will be noted that No. 2 morning was tapped 18 times against 16 times of No. 1.

Experiment II (Morning).

GROUPS OF 10 TREES.

Reg. No. of Tree.	Working Number.	Registered Girth at 3 feet from Ground.	Mode of Incision.	Date.	Amount Ounces.	Times Tapped.	Total Ounces.	Average Yield per Tree. Ounces.	Comparative Yield per inch of Girth.	Remarks.
		Ft. in.		July.	*					
45		3 0	Long	30	2½					
				Augt.						
152		2 6½	Oblique	2	5					
79		2 9¼	Alternate days.	4	7					
				6	11½					
84		2 8¼		10	12					
88	Group I	2 9		12	9					
	1st			15	8½					
92		2 11½		17	7	16	137½	$13\frac{7}{10}$	Under ½ ounce.	
94	Group.	2 11½		19	10½					
				23	9					
107		2 10¼		25	11					
110		3 0		27	10½					
				29	8½					
144		2 9½		31	9					
	Aggregate Girth ...	28 3¾ †		Sept.						
				2	8					
				20	8½					

* Nearly dry Biscuit. † Each tree between 2 feet 6 inches and 3 feet in girth.

Experiment II (Morning).

GROUPS OF 10 TREES.

Reg. No. of Tree.	Working Number.	Registered Girth of 3 feet from ground.	Mode of Incision.	Date.	Amount Ounces.	Times Tapped.	Total Ounces.	Average Yield per Tree. Ounces	Comparative Yield per inch of Girth.	Remarks.
		Ft. in.		Augt.	*					
117		2 $6\frac{3}{4}$	Long	1	$3\frac{3}{4}$					
123		2 $11\frac{1}{2}$	Oblique	3	$5\frac{1}{4}$					
				5	$12\frac{1}{2}$					
125		2 9	Alternate days	8	9					
128		2 $10\frac{1}{2}$		11	9					
	Group I			13	9					
132	2nd	2 $9\frac{3}{4}$		16	$7\frac{3}{4}$	16	$139\frac{1}{4}$	$13\frac{9}{10}$	Under $\frac{1}{2}$ ounce.	
137		2 7		18	12					
	Group.			20	$10\frac{1}{2}$					
139		2 $11\frac{1}{2}$		22	$8\frac{3}{4}$					
141		2 $6\frac{3}{4}$		24	$8\frac{1}{2}$					
145		2 $10\frac{1}{2}$		26	$12\frac{1}{2}$					
				30	9					
146		2 $9\frac{1}{2}$		Sept.						
	Aggregate Girth ...	27 $8\frac{3}{4}$ †		1	$8\frac{1}{2}$					
				10	7					
				20	$6\frac{1}{2}$					

* Nearly dry Biscuit. † Each tree between 2 feet 6 inches and 3 feet in girth.

Experiment II (Morning.)

GROUPS OF 10 TREES.

Reg. No. of Tree.	Working Number.	Registered Girth at 3 feet from Ground	Mode of Incision.	Date.	Amount. Ounces.	Times Tapped.	Total Ounces.	Average Yield per Tree. Ounces.	Comparative Yield per inch of Girth.	Remarks.
		Ft. in.		July. 30	* 2½					
239		2 8¾	Long.	Augt. 1	2					
243		2 6¼	Oblique.	2	8½					
245		2 6½	Daily.	3	10½					
				4	8					
246		2 6¾		5	10¼					
				6	10¼					
247	II	2 7¼		8	8½					
289		2 8½		10	11½	18	139½	13 9/10	Under ½ ounce.	
251		2 9¾		11	8½					
				12	8					
253		2 8¼		13	8					
256		2 10½		15	8½					
				16	8½					
259		2 7¼		17	7					
				18	7½					
	Aggregate Girth ...	26 7¾†		19	5¾					
				20	5¾					

* Nearly dry Biscuit. † Each tree between 2 feet 6 inches and 3 feet in girth.

Experiment II (Morning).

GROUPS OF 10 TREES.

Reg. No. of Tree.	Working Number.	Registered Girth at 3 feet from Ground.	Mode of Incision.	Date.	Amount. Ounces.	Times Tapped.	Total. Ounces.	Average Yield per Tree. Ounces.	Comparative Yield per inch of Girth.	Remarks.
		Ft. in.		July.	*					
				30	1¾					
37		3 2	Long.	Augt.						
44		3 5¾	Oblique.	1	2¾					
				2	11					
55		3 3¾	Daily.	3	11					
64		3 4½		4	9½					
				5	12					
69		3 5½		6	13					
80	III.	3 4½		8	10½					
				10	12½	18	182¾	lb. 1. 2¼ oz.	Under ½ ounce.	
87		3 4		11	11½					
				12	11¼					
105		3 3		13	11					
113		3 6		15	13					
119		3 1¼		16	11½					
				17	10					
	Aggregate Girth ...	33 4¼ †		18	9½					
				19	11					
				20	10					

* Nearly dry Biscuit. † Each tree between 3 feet and 3 feet 6 inches in girth.

Experiment II (Morning).

GROUPS OF 10 TREES.

Reg. No. of Tree.	Working Number.	Registered Girth at 3 feet from Ground.	Mode of Incision.	Date.	Amount. Ounces.	Times Tapped.	Total. Ounces.	Average Yield per Tree. Ounces.	Comparative Yield per inch of Girth.	Remarks.
		Ft. in.		July.	*					
120	IV.	3 $1\frac{1}{4}$	Single.	30	$\frac{3}{4}$					
131		3 1	10 Cups daily.	Augt. 1	$1\frac{3}{4}$					
148		3 3		2	$2\frac{1}{2}$					
153		3 $5\frac{1}{4}$		3	5					
165		3 $3\frac{3}{4}$		4	$5\frac{1}{4}$					
174		3 6		5	9	14	$100\frac{3}{4}$	10	Over $\frac{1}{4}$ ounce.	
185		3 $1\frac{1}{2}$		6	$9\frac{1}{2}$					
198		3 $0\frac{1}{4}$		8	$9\frac{1}{2}$					
203		3 $1\frac{1}{2}$		10	11					
215		3 4		11	$9\frac{1}{2}$					
	Aggregate Girth ...	32 $3\frac{1}{2}$ †		12	10					
				13	11					
				14	8					
				15	8					

* Nearly dry Biscuit. † Each tree between 3 feet and 3 feet 6 inches in girth.

Experiment II (Morning).

GROUPS OF 10 TREES.

Reg. No. of Tree.	Working Number.	Registered Girth at 3 feet from ground.	Mode of Incision.	Date	Amount Ounces.	Times Tapped.	Total Ounces.	Average Yield per Tree. Ounces.	Comparative Yield. per inch of Girth.	Remarks
				July.	*					
		Ft. in.		30	2					
234	V	3 2¾	Herring Bone	Aug.						
				1	3¼					
239		3 4½	Daily	2	9¾					
272		3 3		3	11½					
276		3 3¼		4	11½					
				5	13					
282		3 1¼		6	11¼	18	168	lbs. 1 0$\frac{8}{10}$ oz.	Under ½ ounce.	
313		3 3¼		8	10½					
				10	12					
319		3 4		11	9					
328		3 0½		12	10					
				13	8½					
340		3 5		15	10½					
353		3 1¼		16	9½					
				17	8					
	Aggregare Girth ...	32 4¾†		18	10					
				19	9½					
				20	9					

* Nearly dry Biscuit. † Each tree between 3 feet and 3 feet 6 inches in girth.

Experiment II (Evening.)

GROUPS OF 10 TREES.

Reg. No. of Tree.	Working Number.	Registered Girth at 3 feet from Ground.	Mode of Incision.	Date.	Amount. Ounces.	Times Tapped.	Total. Ounces.	Average Yield. per Tree. Ounces.	Comparative Yield per inch of Girth.	Remarks.
		Ft. in.		July.	*					
				29	2¼					
151		2 7½								
			Long.	Augt.						
53		2 9⅜	Oblique.	1	6					
156		2 8½	Alternate Days.	3	8					
166		2 9¾		5	11½					
				8	11					
169	I.	2 9		10	10					
171	Group I	2 10		12	10½					
				15	8					
180		2 10¾		17	12					
190		2 9¾		19	12					
				22	10½					
194		2 6¾		24	8½	16	145¼	14½	Under ½ ounce.	
195		2 6¾		26	9½					
				29	9½					
				31	8½					
	Aggregate Girth ...	27 4½ †		Sept. 19	7½					

* Nearly dry Biscuit. † Each tree between 2 feet 6 inches and 3 feet in girth.

Experiment II (Evening.)

GROUPS OF 10 TREES.

Reg. No. of Tree.	Working Number.	Registered Girth at 3 feet from Ground	Mode of Incision	Date.	Amount Ounces.	Times Tapped.	Total. Ounces.	Average Yield per Tree. Ounces.	Comparative Yield per inch of Girth.	Remarks.
				July.	*					
		Ft. in.		29	2					
196		2 11¾		Augt.						
204		2 11	Long.	2	5					
			Oblique.	4	12					
208		2 9¾	Alternate Days.	6	12½					
210		2 8		9	10¾					
				11	11½					
211	I Group II	2 7¾		13	12	16	150¾	15	Under ½ ounce.	
218		2 11		16	6					
				18	12½					
224		2 11½		20	10½					
228		2 6½		23	9½					
				25	10½					
230		2 6¼		27	10½					
231		2 9¾		30	8½					
				Sept.						
	Aggregate Girth ...	27 9¼ †		2	9					
				30	8					

* Nearly dry Biscuit. Each tree between 2 feet 6 inches and 3 feet in girth.

Experiment II (Evening).

GROUPS OF 10 TREES.

Reg. No. of Tree.	Working Number.	Registered Girth at 3 feet from Ground.	Mode of Incision.	Date.	Amount. Ounces.	Times Tapped.	Total Ounces.	Average Yield per Tree. Ounces.	Comparative Yield per inch of Girth.	Remarks.
				July.	*					
		Ft. in.		29	$1\frac{1}{2}$					
261		2 10	Long.	30	$1\frac{1}{4}$					
				Augt.						
263		2 $8\frac{3}{4}$	Oblique.	1	$7\frac{1}{4}$					
265		2 $6\frac{1}{2}$	Daily.	2	$7\frac{1}{2}$					
266		2 $7\frac{3}{4}$		3	9					
268		2 11[illegible]		4	9					
	II			5	$8\frac{3}{4}$					
269		2 $9\frac{1}{2}$		6	$8\frac{1}{2}$	18	$124\frac{3}{4}$ ozs.	$12\frac{1}{2}$ ozs.	Under $\frac{1}{2}$ ounce.	
271		3 0		8	8					
275		2 9[illegible]		9	$7\frac{1}{2}$					
280		2 6[illegible]		10	$6\frac{1}{2}$					
284		2 7[illegible]		11	$6\frac{1}{4}$					
				12	$5\frac{3}{4}$					
				13	6					
	Aggregate Girth ...	27 5[illegible] +		15	$9\frac{1}{2}$					
				16	$10\frac{1}{2}$					
				17	6					
				18	$5\frac{1}{2}$					

* Nearly dry Biscuit. + Each tree between 2 feet 6 inches and 3 feet girth.

Experiment II (Evening).

GROUPS OF 10 TREES

Reg. No. of Tree.	Working Number.	Registered Girth at 3 feet from Ground.	Mode of Incision.	Date.	Amount. Ounces.	Times Tapped.	Total. Ounces.	Average Yield per tree. Ounces.	Comparative Yield per inch of Girth.	Remarks.
		Ft. in.		July.	*					
43		3 4¾	Long.	29	1¾					
				30	1¼					
51		3 2¼	Oblique.	Augt.						
62		3 2¾	Daily.	1	5¼					
				2	7¾					
65 *		3 1¼		3	6½					
75		3 4¾		4	7½					
	III.			5	7½					
83		3 3		6	7½	18	110	~~12 2/9~~ 11	Over ¼ ounce.	
103		3 5¼		8	8					
				9	7					
106		3 2¼		10	6					
116		3 6		11	6¾					
				12	5½					
121		3 1		13	6					
Less	tree, 65, Aggregate Girth ...	32 9¼ 3 1¼		15	7½					
				16	6					
				17	6½					
		29 8 ‡		18	5¾					

* Tree 65 started scanty and dropped out altogether. † Nearly dry Biscuits. ‡ Each tree between 3 feet and 3 feet 6 inches in girth.

Experiment II (Evening).

GROUPS OF 10 TREES.

Reg. No. of Tree.	Working Number.	Registered Girth at 3 feet from Ground.	Mode of Incision.	Date.	Amount. Ounces.	Times Tapped.	Total. Ounces.	Average Yield per Tree. Ounces.	Comparative Yield per inch of Girth.	Remarks.
		Ft. in.								
130		3 2¾	Single.	July.	*					
135		3 5½	Daily	29	¼					
149		3 3	(10 cups.)	30	½					
162		3 6		Augt.						
172	IV.	3 5¾		1	3¾					
				2	4½					
181		3 6		3	6½	14	115¼	11½	Over ¼ ounce.	
187		3 0½		4	9					
199		3 1¾		5	11					
				6	12					
213		3 2		8	13¼					
223		3 1		9	12					
				10	10					
	Aggregate Girth ...	32 10¼ †		11	10¼					
				12	10					
				13	11½					

* Nearly dry Biscuit † Each tree between 3 feet and 3 feet 6 inches in girth.

Experiment II (Evening).

GROUPS OF 10 TREES.

Reg. No. of Tree.	Working Number.	Registered Girth at 3 feet from Ground.	Mode of Incision.	Date.	Amount Ounces.	Times Tapped.	Total Ounces.	Average Yield per Tree. Ounces.	Comparative Yield per inch of Girth.	Remarks.
				July.	*					
				29	$1\frac{1}{4}$					
		Ft. in.		30	$1\frac{1}{4}$					
				1	7					
237	V	3 $3\frac{3}{4}$	Herring-bone	2	$6\frac{1}{4}$					
				3	10					
241		3 $1\frac{3}{4}$	Daily	4	11					
				5	10					
273		3 1		6	$9\frac{1}{2}$					
				8	$11\frac{1}{4}$	18	143	$14\frac{3}{10}$	Over $\frac{1}{4}$ Ounce.	
281		3 $3\frac{1}{2}$		9	8					
				10	9					
302		3 2		11	$6\frac{3}{4}$					
				12	$7\frac{3}{4}$					
315		3 $3\frac{1}{4}$		13	9					
				15	8					
326		3 $3\frac{3}{4}$		16	10					
				17	9					
338		3 $0\frac{3}{4}$		18	8					
349		3 5								
355		3 $5\frac{1}{2}$								
	Aggregate Girth ...	32 $6\frac{1}{4}$ †								

Morning Tappings $868\frac{3}{4}$ ounces = lbs. $54.4\frac{3}{4}$ ozs.

Evening Tappings $792\frac{3}{4}$,, = lbs. $49.8\frac{3}{4}$ ozs.

* Nearly dry Biscuit † Each tree between 3 feet and 3 feet 6 inches.

Experiment III.

The single method again compares badly, only 5 incisions were opened daily hence the long period, 23 days, of tapping. As compared with trees of the same size it will be noted that the oblique incisions were on alternate days. The advantage of tapping on alternate days is also shown with the herring-bone method both morning and evening tappings.

Experiment III (Morning.)

GROUPS OF 10 TREES.

Reg. No. of Tree.	Working Number.	Registered Girth at 3 feet from Ground	Mode of Incision.	Date.	Amount. Ounces.	Times Tapped.	Total. Ounces.	Average Yield per Tree Ounces.	Comparative Yield per inch of Girth.	Remarks.
		Ft. in.		Augt.	*					
				30	1¼					
108		1 7	Long.	Sept.						
288		1 10½	Oblique.	1	2¼					
402		1 11¼	Alternate Days.	3	7					
				6	6					
109		1 9¾		8	6¼					
290		1 7¼		10	5½					
413	II Group I	1 11¼		13	4¼					
				15	4¾					
129		1 5¼		17	4¼	15	64¼	$6\frac{4}{10}$	Over ¼ ounce.	
				20	4					
291		1 8¾		22	4½					
430		1 11		24	3¾					
				27	3½					
134		1 10		29	3¾					
	Aggregate Girth ...	17 8 †		Oct.						
				1	3¼					

* Nearly dry Biscuit. † Each tree under 2 feet in girth.

Experiment III (Morning).

GROUPS OF 10 TREES.

Reg. No. of Tree.	Working Number.	Registered Girth at 3 feet from Ground	Mode of Incision.	Date.	Amount. Ounces.	Times Tapped.	Total. Ounces.	Average Yield per Tree. Ounces.	Comparative Yield per inch of Girth.	Remarks.
		Ft. in.		Augt.	*					
292		1 11¾	Alternate Days.	31	1½					
444		1 10½		Sept.						
136		1 8¾		2	6					
				5	6½					
293		1 11		7	5¼					
451		1 6		9	6¼					
				12	5¼					
157	II Group II	1 7½		14	3¾	15	73¼	$7\frac{3}{10}$	Over ¼ ounce.	
299		1 9½		16	6					
				19	5½					
452		1 9¾		21	4½					
170		1 9		23	4¾					
				26	4					
301		1 10		28	5½					
	Aggregate Girth ...	17 9¾ †		30	3¼					
				Oct.						
				3	5¼					

* Nearly dry Biscuit. † Each tree under 2 feet in girth.

Experiment III (Morning).

GROUPS OF 20 TREES.

Reg. No. of Tree.	Working Number.	Registered Girth at 3 feet from Ground. Ft.	in.	Mode of Incision.	Date.	Amount. Ounces.	Times Tapped.	Total. Ounces.	Average Yield per Tree. Ounces.	Comparative Yield per inch of Girth.	Remarks.
					Augt.	*					
212	IV.	1	6½	Single.	30	½					
217		1	10¾		31	1					
219		1	10½	Daily.	Sept.						
229		1	8½		1*	2					
233		1	11¾	Each tree 5 incisions only.	2	3½					
342		1	11¼		3	4					
347		1	9¼		5	4¾					
348		1	9¾		6	3¾					
351		1	7¼		7	4¼	23	100¾	5	Under ¼ ounce.	
362		1	9½		8	4¾					
78		1	8¼		9	4½					
242		1	11½		10	5					
367		1	10½		12	5					
82		2	0		13	4¾					
250		1	8		14	3½					
374		1	7¼		15	4½					
85		1	10½		16	5¾					
252		1	9¾		17	5					
375		1	8½		19	4½					
89		1	11		20	5½					
					21	5½					
	Aggregate Girth ...	36	0¼ †		22	7					
					23	6¼					
					24	5½					

* Nearly dry Biscuit. † Each tree 2 feet or less.

Experiment III (Morning).

GROUPS OF 10 TREES.

Reg. No. of Tree.	Working Number.	Registered Girth at 3 feet from Ground	Mode of Incision.	Date.	Amount. Ounces.	Times Tapped.	Total Ounces.	Average Yield per Tree. Ounces.	Comparative Yield per inch of Girth.	Remarks,
		Ft. in.		Augt.	*					
612	III	3 0½	Herring-bone Daily.	30	1¼					
617		3 1¼		31	2					
				Sept.						
619		3 4¾		1	4					
				2	6					
621		3 2½		3	5					
626		3 1¼		5	6½					
				6	5¾					
628		3 0½		7	6					
630		3 2½		8	7¼					
				9	5½					
633		3 1⅞		10	7					
637		3 5¾		12	7					
				13	6¼					
646		3 1¾		14	4	18	98½	9 8/10	Over 1 ounce.	
	Aggregate Girth ...	31 9¾ †		15	6					
				16	7¼					
				17	5½					
				19	6¼					

* Nearly dry Biscuit. † Each tree between 3 feet and 3 feet 6 inches in girth.

Experiment III (Morning).

GROUPS OF 10 TREES.

Reg. No. of Tree.	Working Number.	Registered Girth at 3 feet from Ground.	Mode of Incision.	Date.	Amount. Ounces	Times Tapped.	Total. Ounces.	Average Yield per Tree. Ounces.	Comparative Yield per inch of Girth.	Remarks.
		Ft. in.		Augt.	*					
364		3 4	Herring bone	30	¾					
371		3 0¾		Sept.						
372		3 4½	Alternate days.	1	2½					
380		3 3		3	13					
385	V.	3 2¾		6	12					
				8	12½					
399	Groupe I.	3 0¼		10	10					
				13	11¾					
408		3 1¾		15	11¼	15	147	14 7/10	Under ½ ounce.	
409		3 4¾		17	11¾					
				20	11½					
411		3 1½		22	11					
				24	10					
412		3 2½		27	10½					
	Aggregate Girth ...			29	10½					
		32 1¾ †		Oct.						
				1	8					

* Nearly dry Biscuit. † Each tree between 3 feet and 3 feet 6 inches in girth.

Experiment III (Morning).

GROUPS OF 10 TREES.

Reg. No. of Tree.	Working Number.	Registered Girth at 3 feet from Ground.	Mode of Incision.	Date.	Amount. Ounces.	Times Tapped.	Total. Ounces.	Average Yield per Tree. Ounces.	Comparative Yield per inch of Girth.	Remarks.
		Ft. in.		Augt.	†					
494		3 $0\frac{3}{4}$	Herring bone	31	2					
502		3 $5\frac{3}{4}$	Alternate days.	Sept.						
503		3 $5\frac{3}{4}$		2	$8\frac{1}{2}$					
515		3 $4\frac{3}{4}$		5	$12\frac{1}{4}$					
	V.			7	$11\frac{1}{2}$					
518		3 $5\frac{3}{4}$		9	$10\frac{3}{4}$					
522	Groupe II.	3 $4\frac{3}{4}$		12	14					
523		3 $3\frac{3}{4}$		14	$4\frac{3}{4}$ *					
				16	13					
541		3 $4\frac{1}{2}$		19	13					
553		3 3		21	12					
554		3 $3\frac{3}{4}$		23	14					
				26	10	15	$161\frac{1}{2}$	b. 1. $\frac{1}{16}$	Under $\frac{1}{2}$ ounce.	
	Aggregate Girth ...	33 $6\frac{1}{2}$ ‡		28	$11\frac{1}{2}$					
				30	$13\frac{1}{2}$					
				Oct.						
				3	$10\frac{3}{4}$					

* Part spoiled by Rain. † Nearly dry Biscuit. ‡ Each tree between 3 feet and 3 feet 6 inches in girth.

Experiment III (Evening).

GROUPS OF 10 TREES.

Reg. No. of Tree.	Working Number.	Registered Girth at 3 feet from Ground.	Mode of Incision.	Date.	Amount Ounces.	Times Tapped.	Total Ounces.	Average Yield per Tree. Ounces.	Comparative Yield per inch of Girth.	Remarks.
				Aug.	*					
		Ft. in.		30	$1\frac{1}{4}$					
417		3 $0\frac{1}{2}$	Herring-bone	Sept.						
434		3 $0\frac{1}{2}$	Alternate days.	1	4					
				3	$9\frac{1}{2}$					
437		3 $2\frac{3}{4}$		6	10					
445	V	3 $1\frac{1}{4}$		8	$10\frac{1}{2}$					
450	Group.	3 $3\frac{1}{2}$		10	$12\frac{1}{2}$					
460	I	3 $4\frac{3}{4}$		13	$14\frac{1}{2}$					
				15	$13\frac{1}{4}$	15	$157\frac{1}{4}$	$15\frac{7}{10}$	Under $\frac{1}{2}$ ounce.	
468		3 $4\frac{1}{2}$		17	$10\frac{1}{2}$					
479		3 $2\frac{3}{4}$		20	12					
				22	11					
485		3 $0\frac{1}{2}$		24	$14\frac{1}{2}$					
493		3 $0\frac{1}{2}$		27	$11\frac{1}{4}$					
	Aggregate Girth ...	31 $9\frac{1}{2}$ †		29	$11\frac{1}{2}$					
				Oct.						
				1	11					

* Nearly dry Biscuit.

† Each tree between 3 feet and eet 6 inches in girth.

Experiment III (Evening).

GROUPS OF 10 TREES.

Reg. No. of Tree.	Working Number.	Registered Girth at 3 feet from ground.	Mode of Incision.	Date.	Amount Ounces.	Times Tapped.	Total Ounces.	Average Yield per Tree. Ounces.	Comparative Yield per inch of Girth.	Remarks.
				Aug.	*					
		Ft. in.		31	$1\frac{1}{2}$					
582		3 $2\frac{1}{2}$		Sept.						
584		3 $1\frac{3}{4}$		2	$5\frac{1}{4}$					
				5	$9\frac{1}{2}$					
590		3 $3\frac{3}{8}$		7	$9\frac{1}{2}$					
592	V	3 $4\frac{1}{4}$		9	$10\frac{1}{2}$					
595		3 $1\frac{7}{8}$		12	10					
	Group			14	9					
597	II	3 3		16	$11\frac{1}{4}$	15-1	$126\frac{3}{4}$	$12\frac{6}{16}$	Over $\frac{1}{4}$ ounce.	
603		3 4		19	$7\frac{3}{4}$					
604		3 $4\frac{3}{4}$		21	$11\frac{3}{4}$					
605		3 $3\frac{1}{2}$		23	$7\frac{1}{2}$					
				26	$8\frac{1}{2}$					
699		3 $4\frac{1}{2}$		28	12					
	Aggregate Girth ...	32 $8\frac{3}{4}$ †		30	$10\frac{3}{4}$					
				Oct.						
				3	2 ‡					

* Nearly dry Biscuit. † Each tree between 3 feet and 3 feet 6 inches in girth. ‡ Rain.

Experiment III (Evening)

GROUPS OF 10 TREES.

Reg. No. of Tree.	Working Number.	Registered Girth at 3 feet from Ground.	Mode of Incision.	Date.	Amount. Ounces.	Times Tapped.	Total. Ounces.	Average Yield per Tree. Ounces.	Comparative Yield per inch of Girth.	Remarks.
		Ft. in.		Augt.	*					
454		1 $4\frac{1}{2}$		30	1					
177		1 $10\frac{1}{2}$	Long.	Sept.						
305		1 10	Oblique.	1	$4\frac{1}{4}$					
			Alternate Days.	3	$4\frac{1}{2}$					
457		1 $5\frac{1}{2}$		6	5					
170		1 $11\frac{3}{4}$		8	$4\frac{1}{2}$					
	II			10	$4\frac{1}{2}$	15	58	$5\frac{8}{10}$	Over $\frac{1}{4}$ ounce.	
307	Group I	1 $7\frac{1}{2}$		13	$4\frac{1}{2}$					
458		1 $9\frac{1}{4}$		15	$4\frac{1}{2}$					
				17	$3\frac{3}{4}$					
182		1 11		20	$3\frac{3}{4}$					
308		1 $10\frac{1}{2}$		22	$3\frac{1}{4}$					
				24	5					
204		1 $4\frac{3}{4}$		27	$3\frac{1}{4}$					
	Aggregate Girth ...	17 $1\frac{1}{4}$ †		29	$3\frac{1}{4}$					
				Oct.						
				1	3					

* Nearly dry Biscuit. † Each tree under 2 feet in girth.

Experiment III (Evening.)

GROUPS OF 10 TREES.

Reg. No. of Tree.	Working Number.	Registered Girth at 3 feet from Ground.	Mode of Incision.	Date.	Amount. Ounces.	Times Tapped.	Total Ounces	Average Yield per Tree. Ounces.	Comparative Yield per inch of Girth.	Remarks.
		Ft. in.		Augt.						
184				31	1					
		1 9½	Long.	Sept.						
311		1 10¼	Oblique.	2	3¼					
160		1 7¾	Alternate Days.	5	6					
188				7	4½					
		1 8		9	4½					
320	II Group II	1 11¾		12	5					
471				14	4½	14	56½	5$\frac{6}{10}$	Over ¼ ounce	
		1 4½		16	4¼					
324		1 8½		19	4¼					
474				21	4					
		1 10¼		23	2¼					
192				26	4					
327		1 6½		28	3½					
		1 6½		30	5½					
	Aggregate Girth ...	16 11½ †		Oct.						
				3	Rain					

* Nearly dry Biscuit. † Each tree under 2 feet in girth.

Experiment III (Evening).

GROUPS OF 20 TREES.

Reg. No. of Tree	Working Number.	Registered Girth at 3 feet from Ground.	Mode of Incision.	Date.	Amount Ounces.	Times Tapped.	Total Ounces.	Average Yield per Tree. Ounces.	Comparative Yield per inch of Girth	Remarks.
		Ft. in.		Aug.	*					
				30	½					
255		1 9¼	Single.	31	¾					
386		1 9		Sept.						
90		1 9	5 Incisions on each tree.	1	1¼					
257		1 6		2	2					
388		1 9¼		3	2¼					
91		1 8¼		5	3					
258		1 9¾		6	2¾					
389		1 6¾		7	3½					
96		2 0		8	3¼	23	81¾	~~44~~ 4	Under ¼ ounce.	
267	IV	1 8½		9	4					
390		1 4		10	3¾					
98		1 10		12	5					
270		1 4¼		13	4½					
391		1 4		14	4					
99		1 10¾		15	4½					
277		1 11¼		16	4¼					
392		1 7½		17	3¾					
101		1 7		19	4					
279		1 9½		20	4¾					
395		1 9		21	4½					
	Aggregate			22	6½					
	Girth ...	33 9 †		23	4¾					
				24	4¼					

* Nearly dry Biscuit. † Each tree (excepting ounce) under 2 feet in girth.

Experiment III (Evening).

GROUPS OF 10 TREES.

Reg. No. of Tree.	Working Number.	Registered Girth at 3 feet from Ground.	Mode of Incision.	Date.	Amount. Ounces.	Times Tapped.	Total. Ounces.	Average Yield per Tree. Ounces.	Comparative Yield per inch of Girth.	Remarks.
		Ft. in.		Augt.	*					
651	III.	3 $3\frac{1}{4}$	Herring bone Daily.	30	$\frac{1}{2}$					
656		3 $3\frac{1}{8}$		31	$1\frac{3}{4}$					
658		3 1		Sept. 1	$5\frac{1}{4}$					
666		3 $1\frac{1}{4}$		2	$5\frac{3}{4}$					
667		3 $3\frac{3}{4}$		3	$5\frac{1}{4}$					
671		3 $2\frac{1}{2}$		5	8					
674		3 $3\frac{1}{2}$		6	6					
679		3 2		7	$8\frac{1}{2}$					
611		3 3		8	8					
701		3 1		9	8					
				10	$7\frac{3}{4}$					
				12	$10\frac{1}{2}$					
				13	8					
				14	$8\frac{3}{4}$					
				15	$7\frac{1}{4}$					
				16	$7\frac{3}{4}$					
				17	7					
	Aggregate Girth ...	32 $0\frac{1}{4}$ †		19	$7\frac{3}{4}$	18	$121\frac{3}{4}$	$12\frac{7}{40}$	Under $\frac{1}{4}$ ounce.	

Morning Tappings ... ... $645\frac{1}{4}$ ounces = 40 lbs. $5\frac{1}{4}$ ozs.
Evening ,, ... 601 ,, = 37 lbs. $9\frac{1}{2}$ ozs.

* Nearly dry Biscuit. † Each tree between 3 feet and 3 feet 6 inches in girth.

Rainfall for the Months of July, August and September, 1904.

July.		August.		September.	
Date.	Inch.	Date.	Inch.	Date.	Inch.
1	...	1	·18	1	·54
2	·02	2	1·38	2	...
3	·11	3	...	3	...
4	...	4	1·97	4	...
5	...	5	·25	5	...
6	...	6	...	6	·14
7	·09	7	·31	7	...
8	...	8	·07	8	·50
9	...	9	1·31	9	·86
10	...	10	·15	10	·05
11	·04	11	...	11	·14
12	·24	12	...	12	·16
13	...	13	...	13	·11
14	...	14	...	14	·44
15	...	15	...	15	·04
16	...	16	...	16	...
17	...	17	1·69	17	...
18	·70	18	...	18	·11
19	...	19	...	19	...
20	·20	20	...	20	...
21	...	21	·30	21	...
22	·88	22	·05	22	...
23	·01	23	...	23	...
24	1·06	24	·75	24	...
25	·72	25	...	25	...
26	·23	26	·14	26	1·05
27	·07	27	·46	27	...
28	1·12	28	·55	28	...
29	...	29	...	29	...
30	·57	30	·35	30	...
31	...	31	...	31	...
Total ...	6·06	Total ...	9·91	Total ...	4·08

R. BERRY.

METHODS OF TAPPING RUBBER TREES AND COLLECTING LATEX.

A visit of inspection which I recently paid to the various rubber plantations in the Federated Malay States, shewed me in a way that figures and statistics could not have done the amount of labour and capital that has been spent in this industry, and brought very vividly home to me the great value of the plantations to the country and gave me some slight idea of the wealth of return immediately coming to those who have interests in these estates. But it also demonstrated the state of chaos that exists in all that concerns the practical harvesting of the rubber. That this should be so is inevitable, and at it no surprise can be felt when it is remembered that as an agricultural industry rubber growing is in its infancy, and that there is no accumulated experience gained by planters in the past to serve as guide. It is true that different experiments on a small scale have been made, and small amounts of rubber turned out and exported, but no large estate has yet been thoroughly tapped and no method at present in use has been put to the test of practical applicability in a systematic manner to a large estate of, say, 1,000 acres. I propose to review the methods that have been put forward and which have in a mild and tentative manner been adopted, and to endeavour in a scientific manner to critically examine the probability of their success on a large scale and to give some scheme which as the result of this analysis may be adopted. In the first place the aim of all and on this one and only point, is there anything like full agreement, is to make money, that is to say to obtain the greatest possible return of rubber with the least possible expenditure, without doing damage to the trees, without killing the goose that is to lay the golden eggs. Each system of tapping therefore, must be looked at from the three points of view, namely the return of rubber, the cost of working and the probable damage to the trees as sources of rubber. Aesthetic and sentimental considerations can have no place.

The first and a simple system is that of single cuts, each being a few inches long, and obliquely set. The inclination being from 20° to 30° to the horizontal. At the lower end of each cut, a cup is fixed by being pushed into the bark, the portion of the bark thus raised acting as a lip over which the latex trickles into the cups.

On successive or on alternate days the lower face of the cut is pared off and the latex caused again to flow. This process, continued for about fifteen times of reopening, has with individual trees yielded a large return of rubber per tree—some claim that the largest returns have been obtained in this way. It is also claimed that the scars heal quickly. That the returns per length of cut surface are any greater with this method than with any other I very much doubt. Experiments made with a few trees or with small sets of trees are certainly of value, but in so far as they are not carried out under the same conditions of cooly labour and rate of working as would obtain on a large estate in actual practice must

be accepted with reserve, and until tests have been made on an estate over a considerable area by estate coolies I consider the increased returns shewn by this system to be not proved.

There are on the other hand very real objections to this method. In the first place the cuts are scattered and irregular and while no damage is done to the tree itself, yet the bark is greatly roughened and the tapping surface rendered irregular and more difficult to work a second time. From my own observation, I am inclined to believe that the gaping of the bark produced by a first cut is out of all proportion to the material removed. It is rather like the effect of the first cut into a roast leg of mutton. Subsequent shaving and reopening widens the gape by the amount removed and by no more. Consequently a disjointed and scattered series of short cuts leads to a rough and scarred bark on which is difficult to work. But a second and more important objection is the number of cups required for such a style of tapping. Ten cups to a moderate sized tree—say 28 inches girth at 3 feet from the base, is a very modest allowance. It only requires a simple multiplication sum to shew that with 1,000 acres of 120 trees to the acre, and the plantation tapped entirely twice a year, each cut being reopened fifteen times, nearly 100,000 cups would be required daily, or taking each cup as weighing about one ounce, then over two tons of cups would be carried out and used every day. The labour of washing and drying the waste of latex as scrap from the cups to say nothing of the wear and tear which is excessive, when they have to be forced into the bark of the tree in fixing, require it to be very clearly and definitely established that a superior yield of rubber results from this system of tapping if it is not to be entirely condemned. It certainly is not a system, which in the present state of our knowledge can be recommended.

Another system of tapping which I understand was first tried in Ceylon is to make single cuts in such a position that the end of one is two or three inches vertically above the beginning of the second. These two cuts are then connected by a narrow vertical cut.

The way in which this system has been evolved, is, I think easy to see. The number of cups required with single cuts and the labour involved in their use had, even with small estates, become considerable, and evidently by connecting the cuts in pairs the number of cups required would be halved. But if the intention be to economise cups and labour, this system does not go far enough, and in any case it is difficult to see the advantage of this fancy zig-zag cut over a single straight cut extending from the commencement of the first to the end of the second cut.

This system has, I consider nothing to commend it, and in the irregular scarring of the bark and difficulty in fitting in new cuts on subsequent occasions on the areas untapped, is a special difficulty.

A third system is that known as V cutting, and the name explains the arrangement perfectly. The original cuts are reopened from

day to day as in the case of the system of single cuts. There is an economy of half the cups required on the single system, but there the advantage over that system ceases. There is, however, the same objection of irregularity and lack of adaptability to a systematic working over the whole of the tapping area of the trunk, together with the additional disadvantage that the apex of the V is a weak point where the bark and the wood are apt to be badly wounded.

The three methods already described are difficult to carry out on a definite system in such a way that the whole of the tappable area shall be worked over in a definite time. They involve an excessive amount of scarring of an irregular kind and require too many cups.

The two methods that remain to be considered are known as the herring bone and half herring bone. The "herring bone" is made as follows:—a channel is cut vertically from the base of the trunk to a height of two, three or four feet according to the size of the tree, branching from this central cut are lateral inclined cuts at regular distances apart and alternately placed to the right and left of the central channel. The half herring bone differs from the herring bone in that the lateral cuts are on one side only of the central channel and they are usually of greater length. On reopening, the central vertical channel is left untouched, but the lower face of each lateral cut is reopened.

The vertical channel is merely a conduit for the latex and the collecting cup is placed at the lower end of it. These two methods of tapping present some very real advantages, in the first place the cuts are regular in position and can be easily and systematically arranged and that too in such a way that the whole of the area of the trunk can be tapped in a definite period of time, the number of cups is reduced to the minimum, only one or at most two being required for each tree.

If in addition a small metal spout, easily made by bending a slip of tinned iron, be fixed into the base of the tree at the end of the vertical cut, the cups need never be damaged by forcing their edges into the bark of the tree, but can be hung by a peg to the tree below the spout or merely placed upon the ground.

The central channel is never reopened nor is the spout removed during the whole of the time each tree is tapped and the latex is as clean as it is possible to have it.

The real and material advantages are the practical economy of time and labour in cup fixing, collecting and washing, the saving in wear and tear of the cups and in the number initially required, and added to these are the advantages of being able to work on a definite system.

It has been objected that the use of one central collecting channel leads to more "scrap" rubber, on account of some of the latex coagulating in that channel every day. This is certainly true, but

the percentage increase is not much, and with the use of a washing machine scrap will be very little less valuable than fine rubber.

The half herring bone differs from the full herring bone in that the lateral cuts are made on one side only of the vertical channel. The cuts may be to the right or left as in found most convenient to the cooly in cutting, and the cuts are twice the length of those in the full herring bone.

This method will, I believe, shew advantage over the full herring bone in so far as it will adapt itself to the general right handedness of the cooly if all the cuts slope up from right to left, and this method of cutting is I believe the best that will be adopted.

The advantages may for the sake of clearness be recapitulated:—

The number of cups is a minimum. The wear and tear of the cups is reduced to the smallest value.

The method is capable of being systematically carried out on a large scale.

The plan of cutting is simple and adapted to quickest and easiest manual labour.

From the foregoing consideration it may, I think, be fairly assumed that the "half herring bone" is the method to be adopted, and it now remains to shew how the areas for tapping may be plotted out and systematically arranged.

Here I feel to be treading on rather dangerous ground in so far as lack of knowledge of practical planting may subject me to the accusation of meddling with things outside my own domain. That I have no intention of doing, all that relates to the tapping and collection of latex, the effect of wounding rubber trees, the age at which tapping may be safely begun and kindred subjects are fit and suitable for discussion by any one who troubles to read the evidence by which controversial opinions are formed. But to return, assuming the half herring bone with lateral cuts half way round the tree, assuming the cuts to be reopened nineteen times and one-eighth of an inch removed in each of these occasions—taking the initial cut as being about half an inch in width, there will finally result a scar three inches wide. For the purpose of illustration we may suppose the trees after tapping are given a rest of six months and then again tapped, this time on the opposite side of the trunks, after another six months they will be again tapped on the original side, opening lateral cuts immediately below the original ones, at the end of a further half year the similar process with be applied to the opposite side of the tree. In this way, if the orginal lateral cuts were at intervals of six inches the whole of the area of the trunk suitable for tapping would be worked over once in two years, by which time the first formed scars would be completely healed.

It is clear too that each tree would be in use, that is being tapped, on two occasions of twenty days each during the year, that is to say would be in milk on 40 days in the year. It therefore follows that $\frac{40}{365}$ total number of trees fit for tapping must be

tapped on each day. Making an allowance for days on which by reason of stress of weather, festivals, or other circumstances no tapping is possible, this fraction may be taken as equivalent to 12%.

This may of course be divided into two lots of 6% for morning and evening tappings.

Whether each individual tree be reopened on each successive day or on alternate days will not affect these results, it would mean that different sets of trees would be worked on alternate days but each set would comprise 12% of the total trees.

The division of the trees into groups for morning and evening tapping will make it advisable to cut the central channel for the morning group on the South side of the trunk, that for the evening tapping on the North side of the tree so as to avoid the coagulation of the latex in the cuts by the influence of sunshine.

The preceding calculation can be put in general terms and a formula given thus.

Let **W** be the width of the first cut.

— w be the thickness removed by each subsequent cut.

— **T** be the interval of rest between successive tappings, measured in years.

— t be the number of times each cut is reopened.

— **D** be the days per annum when tapping is impossible.

Then the spaces to be left between the lateral branches of the herring bone are $\dfrac{tw+\mathbf{W}}{\mathbf{T}}$

The percentage of trees tapped daily $\dfrac{100t+100}{365\,\mathbf{T}-\mathbf{DT}}$

The thicknesses are measured vertically in inches. By stating the matter in this condensed form the nature of the inconstant quantities is clearly realised.

Thus **W** the width of the first cut depends upon the tool used and the skill of the user, similarly for the value of w. If for instance w could be made 1/16 instead of 1/8 inch it would reduce the space between the side arms of the herring bone from 6 inches to $3\frac{1}{2}$ assuming the value for t to be constant. Whether this would be too close for practical work, whether the areas drained by the separate cuts would seriously overlap is not known, on this point experiments are needed, because it is certain that before long a special tool to cut a thin shaving not more than 1/16 inch will be available.

Then the value of t, the times of reopening, is at present not fixed. Various values ranging from 10 to 25 have been assigned as suitable. Experimental results are here needed, and probably each estate will eventually have a special value for this quantity. For the moment it can be safely assumed that 15 is not too high a value.

That the maximum value should be ascertained and always used is clear from the expression given for the percentage of trees tapped daily where it is seen that the percentage increases as t increases, this put into practical form means that more trees would be always available for tapping and the returns from the estate would be correspondingly greater. The most pressing need at present is that the limiting values for this quantity and for the necessary period of rest **T** be determined experimentally, until that be done the probable returns to be expected from estates can only be guessed at, and there is and can be no guarantee that the crop is not being partially wasted though neglect of harvesting it completely.

There are numerous details such as the shape of the cross section of the cuts, the collection of scrap, the preliminary addition of preservative to the cups, the cutting tool to be used, which I have purposely left untouched fearing that their introduction would tend to obscure the two main issues of the selection of the type of cut to be adopted and the way in which the adoption can be carried out systematically.

These details are for the field rather than the study and if considered should be the subject of a special communication.

P. J. BURGESS.

R. C. 1770/04.

RESIDENT COUNCILLOR'S OFFICE,
Malacca, 22nd October, 1904.

SIR,—You may like to notice in the next Agricultural Bulletin the enclosed list of prices received for a parcel of Para rubber prepared in the Government Gardens at Bukit Sebukor in Malacca under the supervision of Mr. F. B. GAGLIARDI, then an Officer of the Malacca Forest Department.

2. The rubber was dried without the addition of any acid whatsoever.

I have, &c.,

R. N. BLAND.
Acting Resident Councillor.

The Editor,
Agricultural Bulletin,
Singapore.

Singapore, 4th October, 1903

THE HON'BLE R. N. BLAND,
Acting Resident Councillor,
MALACCA.

Rubber.

SIR.—We beg to confirm our respects of the 27th ultimo and now advise that we have received advice from our London friends of the sales of the following parcels :—

lbs.			s. d.	
$6\frac{3}{4}$	No. 1 Fine Clean Biscuits	at	5/8 p. lb.	
$5\frac{1}{2}$	No. 2 ,, ,, ,,	at	5/7 ,,	
$6\frac{1}{2}$	No. 3 Good clean Biscuits slightly darker	at	5/6 ,,	A/C Forest Dept. Malacca.
2	No. 4 Good Ball 1 inferior dark and sandy	at	3/9 ,,	

We expect to receive account sales shortly and will forward them with a remittance in due course.

We have, etc.,

PATERSON SIMONS & CO.

RUBBER PROSPECTS.

NO REASON YET TO BE DISCOURAGED.

The recent success of the rubber planters of Ceylon in marketing the product of their cultivated *Hevea* trees, at the the highest prices on record for crude rubber of any kind, seems to have had a disquieting effect upon some of the planters of Castilloa in Mexico. At least they are wondering whether they have not made a mistake in planting Castilloa, when perhaps by cultivating another species the same investment and the same amount of labour might bring larger returns until the favourable results in the Far East were reported, the rubber planters in Mexico were not only satisfied with their progress and prospects, but they were enthusiastic. It remains to be seen whether they should become any less so.

In the first place, it is not certain that the *Hevea* species, the rubber of Para, are as well adopted to Mexico as to Ceylon and the Malay States. They may yet prove to be but that is another matter. But Mexico is the home of *Castilloa*, the source of the first rubber of which any written record exists. And it yields a good rubber, a material for which the industry affords a certain and permanent demand. The product of *Castilloa*, as now market, is worth less commercially than *Hevea* rubber. So is silver worth less by weight than gold, but this fact neither discourages silver mining nor limits the use of the cheaper metal in the arts. The question is not whether the rubber grown in Ceylon will sell for more than the Mexican product, but whether the Mexican plantations now under way will yield fair returns on the capital invested.

No-body knows what Mexican rubber, prepared under intelligent supervision, is going to bring, as compared with others rubbers. We know what manufacturers are paying for the stuff which the Mexican Indians carry in driblets to Tuxtepec and Vera Cruz and Tampico, and which is shipped thence ungraded to New York. But we do not understand that any planters are contemplating the shipment of rubber so prepared. What rubber really costs at the factory is not the price paid to the importer, but it is the cost of the rubber after it has been cleaned and dried.

Thus Para rubber, imported at $1 a pound, with 15 per cent of shrinkage in clearing, really costs the manufacturer $1.17½. At the same time Mexican rubber, imported at only 75 cents, with 30 per cent shrinkage, really costs at the factory $1.07 a pound. The chief explanation of the high prices obtained by the Ceylon planters is that they don't ship dirt to market; the percentage of shrinkage in their product is almost nil. Hence when some Ceylon rubber sold recently in London at $1.29¼ per pound, while Central American rubber brought only 81 cents, this difference alone formed no reason for discouraging the planters of *Castilloa*, which yields the Central sorts. The latter rubber might have brought $1 more, if prepared as carefully as the Ceylon rubber.

It is not meant here that, under any method of treatment now understood, rubber absolutely equal to "Para" can be prepared from *Castilloa*; the rubbers are characteristically unlike in important respects. But in comparing the selling prices of rubber, consideration should be given to the causes for the existing difference in results obtained, not the least of which is due to the degree of care exercised in preparing rubber for market.

It appears that not all of the rubber planters of the Far East are wholly satisfied with their prospects. At least some of them are heard from now and then who fear that somebody else is likely to do better than they are doing. Some of them, for instance, feel that the *Castilloa* will prove a more prolific producer of rubber than the *Hevea*, and therefore profitable. Some such complaints have led *The Straits Times*, published at Singapore, to assert that the planters have no cause for worry, "for there can be no doubt that they have wonderful market waiting for all the rubber of any kind that they can produce within this generation."

*India **Rubber** World, Vol. XXX p. 295.*

MISCELLANEOUS.

Notices to Subscribers.

1. For the information of subscribers and others who wish to complete their series of Bulletins, notice is given that numbers 1, 7, 8 and 9, of the old Series (1891 to 1900) and Nos. 1, 8, 9 and 10, of New Series, Vol. I (1901-1902) have been reprinted and

copies can be had by all whose subscriptions are paid up to date. The cost to others is 50 cents a number.

2. A very large number of subscriptions, even for last year, are yet unpaid although subscribers have received more than one notice of the delay in payment. As this entails a good deal of extra work on the staff, subscribers are asked to send in their subscriptions without delay. Attention is called to the rule that all subscriptions should be prepaid.

3. Subscribers changing their addresses are requested to give notice to the Editor.

4. Subscribers outside the Peninsula will in future be charged $3.50 per annum instead of $3 to cover postage.

Meteorological observers are asked to send in their returns to arrive before the 10th day of the following month, if possible, so as to be in time for going to press.

Rainfall for September, 1904 :—

Government Hill	...	Ins. 14·97
The Fort	...	,, 14·82
The Prison	...	,, 14·64
Balik Pulau	...	,, 11·50
Pulau Jerejak	...	,, 11·11
Lumut ...	...	,, 9·14
Bruas ...	...	,, 5·20
Pangkore ...	...	,, 4·51
Butterworth	...	,, 13·48
Bukit Mertajam	...	,, 10·88
Sungei Backap	...	,, 9·88

M. E. SCRIVEN,

Assistant Surgeon,

Prison Observatory.

Penang,

SINGAPORE MARKET REPORT.

September, 1904.

Articles.	Quantity sold.		Highest price.	Lowest price.
	Tons.		$	$
Coffee—Palembang - -	...		26.00	26.00
Bali - -	...		23.50	22.00
Liberian - -	144		22.50	21.00
Copra - - -	2,582		8.90	8.00
Gambier - - -	1,514		9.12½	8.12½
Cube Gambier, Nos. 1 and 2 -	36		14.50	11.75
Gutta Percha, 1st quality -	...		200.00	150.00
Medium -	...		100.00	90.00
Lower -	...		80.00	19.00
Borneo Rubber 1, 2, and 3 -	...		140.00	85.00
Gutta Jelutong - -	...		11.00	9.75
Nutmegs, No. 110's -	...		45.00	45.00
No. 80's - -	...		75.00	73.00
Mace, Banda - -	...		110.00	95.00
Amboyna - -	...		90.00	78.00
Pepper, Black - -	522		29.00	25.75
White - -	201		39.87½	35.25
Pearl Sago, Small - -	125		4.40	3.60
Medium -	25		...	...
Large - -	...		...	...
Sago Flour, No. 1 - -	4,105		3.67½	3.02½
No. 2 - -	320		1.20	1.05
Flake Tapioca, Small -	471		4.20	4.15
Medium -	15	Closing fair.	...	...
Pearl Tapioca, Small -	486		4.20	4.20
Medium -	603		4.20	4.20
Bullet -	10		5.10	5.00
Tin - - -	2,920		75.00	72.87½

Export Telegram to Europe and America.

For Fortnight ending 15th August, 1904.

Wired at 4.15 p. m. on 16th August, 1904.

					Tons.
10	Tin	Str.	Singapore & Penang	United Kingdom &/or	1,527
11	Do.	,,	Do.	U. S. A.	350
12	Do.	,,	Do.	Continent	180
13	Gambier	,,	Singapore	London	50
14	Do.	,,	Do.	Liverpool	120
15	Do.	,,	Do.	U. K. & or Continent	850
16	Cube Gambier	,,	Do.	United Kingdom	50
17	Black Pepper	,,	Do.	Do.	...
18	Do.	,,	Penang	Do.	...
19	White Pepper	,,	Singapore	Do.	90
20	Do.	,,	Penang	Do.	20
21	Pearl Sago	,,	Singapore	Do.	160
22	Sago flour	,,	Do.	London	400
23	Do.	,,	Do.	Liverpool	1,000
24	Tapioca, Flake	,,	Singapore & Penang	United Kingdom	350
25	Do. Pearl	,,	Do.	Do.	500
26	Do. Flour	,,	Penang	Do.	775
27	Gutta Percha	,,	Singapore	Do.	...
28	Copra	,,	Singapore & Penang	Do.	...
29	Buffalo Hides	,,	Singapore	Do.	150
30	Pineapples	,,	Do.	Do.	cases 25,000
31	Gambier	,,	Do.	U. S. A.	390
32	Cube Gambier	,,	Do.	Do.	60
33	Black Pepper	,,	Do.	Do.	30
34	White Pepper	,,	Do.	Do	30
35	Black Pepper	,,	Penang	U. S. A.	...
36	White Pepper	,,	Do.	Do.	...
37	Nutmegs	,,	Singapore & Penang	Do.	19
38	Flake & Pearl	,,	Do.	Do.	180
39	Pineapples	,,	Singapore	Do.	6,500
40	Do.	,,	Do.	Continent	750
41	Gambier	,,	Do.	S. Continent	270
42	Do.	,,	Do.	N. Continent	50
43	Cube Gambier	,,	Do	Continent	60
44	Tapioca Flake	,,	Singapore & Penang	Do.	230
45	Do. Pearl	,,	Do.	Do.	100
46	Copra	,,	Do.	Marseilles	1,850
47	Do.	,,	Do.	Odessa	240
48	Do.	,,	Do.	S. Continent	300
49	Do.	,,	Do.	N. Continent	460
50	Black Pepper	,,	Singapore	S. Continent	260
51	Do.	,,	Do.	N. Continent	20
52	White Pepper	,,	Do.	S. Continent	50
53	Do.	,,	Do.	N. Continent	70
54	Do.	,,	Penang	S. Continent	...
55	Do.	,,	Do.	N. Continent	50
56	Black Pepper	,,	Do.	S. Continent	30
57	Do.	,,	Do.	N. Continent	...
58	Sago Flour	,,	Singapore	U. S. A.	190
59	Do.	,,	Do.	Continent	1,200
60	Do.	,,	Do.	Glasgow	50
61	Gambier	,,	Do.	Do.	...
62	Do.	,,	Do.	U. S. A.	...

					Tons.
63	Flake and Pearl	Str.	Singapore	U. S. A.	.
64	Cube Gambier	,,	Do.	Do	...
65	White Pepper	,,	Do.	Do.	...
66	Do.	,,	Penang	Do.	...
67	Pineapples	,,	Singapore	Do.	...
68	Gambier	,,	Do.	S. Continent	...
69	Copra	,,	Do.	Marseilles	...
70	Black Pepper	,,	Do.	S. Continent	...
71	White Pepper	,,	Do.	Do.	...
72	Black Pepper	,,	Do.	U. S. A.	...
73	Do.	,,	Penang	Do.	...

1,300 tons Gambier } Contracts
150 ,, Black Pepper }

Export Telegram to Europe and America.

For Fortnight ending 31st August, 1904.

Wired at 2.30 p. m. on 1st September, 1904.

10	Tin	Str.	Singapore & Penang	United Kingdom &/or	1,740
11	Do.	,,	Do.	U. S. A.	635
12	Do.	,,	Do.	Continent	302
13	Gambier	,,	Singapore	London	...
14	Do.	,,	Do.	Liverpool	...
15	Do.	,,	Do.	U. K. &/or Continent	190
16	Cube Gambier	,,	Do.	United Kingdom	20
17	Black Pepper	,,	Do.	Do.	10
18	Do.	,,	Penang	Do.	10
19	White Pepper	,,	Singapore	Do.	...
20	Do.	,,	Penang	Do.	30
21	Pearl Sago	,,	Singapore	Do.	60
22	Sago Flour	,,	Do.	London	150
23	Do.	,,	Do.	Liverpool	...
24	Tapioca Flake	,,	Singapore & Penang	United Kingdom	110
25	Do. Pearl	,,	Do.	Do.	120
26	Do. Flour	,,	Penang	Do.	250
27	Gutta Percha	,,	Singapore	Do.	10
28	Copra	,,	Singapore & Penang	Do.	...
29	Buffalo Hides	,,	Singapore	Do.	20
30	Pineapples	,,	Do.	Do.	cases 4,000
31	Gambier	,,	Do.	U. S. A.	10
32	Cube Gambier	,,	Do.	Do.	...
33	Black Pepper	,,	Do.	Do.	180
34	White Pepper	,,	Do.	Do.	...
35	Black Pepper	,,	Penang	Do.	350
36	White Pepper	,,	Do.	Do.	30
37	Nutmegs	,,	Singapore & Penang	Do.	12
38	Flake and Pearl	,,	Do.	Do.	260
39	Pineapples	,,	Singapore	Do.	cases 4,500
40	Do.	,,	Do.	Continent	cases 4,500
41	Gambier	,,	Do.	S. Continent	..
42	Do.	,,	Do.	N. Continent	150
43	Cube Gambier	,,	Do.	Continent	40
44	Tapioca Flake	,,	Singapore & Penang	Do.	40
45	Do. Pearl	,,	Do.	Do.	210
46	Copra	,,	Do.	Marseilles	960
47	Do.	,,	Do.	Odessa	.

					Tons.
48	Copra	Str.	Singapore & Penang	S. Continent	...
49	Do.	,,	Do.	N. Continent	280
50	Black Pepper	,,	Singapore	S. Continent	40
51	Do.	,,	Do.	N. Continent	90
52	White Pepper	,,	Do.	S. Continent	...
53	Do.	,,	Do.	N. Continent	150
54	Do.	,,	Penang	S. Continent	20
55	Do.	,,	Do.	N. Continent	100
56	Black Pepper	,,	Do.	S. Continent	20
57	Do.	,,	Do.	N. Continent	...
58	Sago Flour	,,	Singapore	U. S. A.	20
59	Do.	,,	Do.	Continent	60
60	Do.	,,	Do.	Glasgow	...
61	Gambier	,,	Do.	Do.	...
62	Do.	Str.	Do.	U. S. A.	...
63	Flake and Pearl	,,	Do.	Do.	...
64	Cube Gambier	,,	Do.	Do.	...
65	White Pepper	,,	Do.	Do.	...
66	Do.	,,	Penang	Do.	...
67	Pineapples	,,	Singapore	Do.	...
68	Gambier	,,	Do.	S. Continent	...
69	Copra	,,	Do.	Marseilles	...
70	Black Pepper	,,	Do.	S. Continent	...
71	White Pepper	,,	Do.	Do.	...
72	Black Pepper	,,	Do.	U. S. A.	...
73	Do.	,,	Penang	Do.	...

1,000 tons Gambier
390 ,, Black Pepper } Contracts.

Singapore.

Abstract of Meteorological Readings for the month of September, 1904.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
	Ins.	°F.	°F.	°F.	°F.	°F.	°F.	Ins.	°F	%		Ins.	Ins.
Kandang Kerbau Hospital Observatory	29·992	140·8	80·5	88·3	72·9	15·4	77·1	·855	74·7	77	S.S.W. & S.W.	5·77	2·44

A. B. LEICESTER,
Meteorological Observer.

D. K. McDOWELL,
Principal Civil Medical Officer, S.S.

Kandang Kerbau Hospital Observatory,
Singapore, 18th October, 1904.

Penang.

Abstract of Meteorological Readings in the Prison Observatory for the month of September, 1904.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.					Hygrometer.			Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
	Ins.	°F	°F	°F	°F	°F	°F	°F	%	%		Ins.	Ins.
Criminal Prison Observatory	29·893	134·4	79·3	88·1	73·7	14·4	74·8	·780	70·52	73	N.W.	14·04	2·33

Colonial Surgeon's Office,

Penang, October, 1904.

M. E. SCRIVEN,

Assistant Surgeon.

T. C. MUGLISTON,

Colonial Surgeon, Penang.

Malacca.

Abstract of Meteorological Readings for the month of September, 1904.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
	Ins.	°F	°F	°F	°F	°F	°F	°F	%	%		Ins.	Ins.
Durian Daun Hospital ...	29·844	162·3	79·1	90·0	70·6	19·7	80·9	10·30	70·6	91	N.W.	6·13	2·35

F. B. CROUCHER,

Colonial Surgeon, Malacca.

Colonial Surgeon's Office,

Malacca, 14th October, 1904.

Perak.

Abstract of Meteorological Readings in the various Districts of the State for the month of September, 1904.

DISTRICT.	Maximum in Sun.	Temperature.				Hygrometer.			Total Rainfall	Greatest rainfall during 24 hours.
		Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Humidity.		
Taiping ...	151	82·55	93·5	69	24	76·65	836	75	7·57	2·45
Kuala Kangsar ...	...	80·39	92	69	23	75·51	821	79	4·47	1·86
Batu Gajah ...	158	81·09	94	70	23	76·33	844	79	5·81	1·49
Gopeng ...	...	80·51	94	63	30	75·35	810	78	9·11	2·26
Ipoh ...	...	81·47	93	69	20	76·60	851	79	3·98	1·17
Kampar ...	...	...	94	68	26	...	...	...	2·30	·57
Teluk Anson ...	...	81·57	92	70	21	76·65	849	79	5·49	2·60
Tapah ...	..	81·19	95	67	28	75·87	826	78	8·43	1·47
Parit Buntar ...	...	80·85	91	69·5	17	76·97	878	84	10·24	3·15
Bagan Serai ...	...	82·13	91	69	21	76·92	859	78	10·26	2·72
Selama ...	...	80·63	91	70	20	74·53	775	74	10·35	2·73

STATE SURGEON'S OFFICE,

Taiping, 12th October, 1904.

M. J. WRIGHT,

State Surgeon, Perak.

Selangor.

Abstract of Meteorological Readings in the various Districts of the State for the month of September, 1904.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
General Hospital, Kuala Lumpur	29·877	146·0	81·1	90·2	70·6	19·6	75·0	0·809	72·8	76	Calm.	11·35	4·25
Pudoh Gaol Hospital "	...	...	...	...	...	...	...	...	...	...	...	11·25	3·00
District Hospital "	...	...	...	...	...	...	...	...	...	...	...	9·18	2·42
" Klang	...	...	...	87·2	72·1	15·1	...	...	...	...	...	6.60	1·85
" Kuala Langat	...	...	...	86·6	69·8	16·8	...	...	...	...	...	6·18	1·50
" Kajang	...	...	...	92·5	71·9	20·6	...	...	...	...	...	7·07	1·78
" Kuala Selangor	...	...	...	87·0	74·8	12·2	...	...	...	...	...	8·41	1·15
" Kuala Kubu	...	...	...	90·9	71·8	19·1	...	...	...	...	...	15·39	2·79
" Serendah	...	...	...	...	...	...	...	...	...	...	...	11·01	2·04
" Rawang	...	...	...	86·2	72·6	13·6	...	...	...	...	...	8·53	1·65
Beri-beri Hospital, Jeram	...	...	...	...	...	...	...	...	...	...	...	10·93	1·83
Sabah Bernam	...	...	...	...	...	...	...	...	...	...	..	6·48	3·50
Ulu Gombah	...	...	...	...	...	...	...	...	...	...	...	6·93	1·04

STATE SURGEON'S OFFICE,
Kuala Lumpur, 20th October, 1904.

E. A. O. TRAVERS,
State Surgeon, Selangor.

Pahang.

Abstract of Meteorological Readings in the various Districts of the State for the month of August, 1904.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
Kuala Lipis ...	...	...	...	...	...	...	...	...	...	...	...	...	...
Raub ...	...	...	...	...	...	...	...	...	...	...	...	...	...
Bentong ...	...	...	...	...	...	...	...	...	...	...	...	...	...
Pekan ...	...	...	...	...	...	...	...	...	...	...	...	...	...
Sungei Lembing ...	...	...	...	...	...	...	...	...	...	...	...	...	...
Kuantan ...	...	...	...	87·0	70·0	17·00	...	...	...	...	...	7·13	2·12

Kuantan,
7th October, 1904.

Meteorological Observations taken at Kuala Kuantan, Pahang, during the month of August, 1904.

Date.	Temperature of Air. Maximum.	Minimum.	Range.	Rainfall. 6 A.M	6 P.M.	Total.	Remarks.
1				...	...	...	The lip of rain gauge is 8 feet above mean sea level.
2				...	...	...	
3				0·05	...	0·05	Records are given at time and on day of measurement.
4				...	...	...	
5				...	...	...	
6				...	...	...	
7				...	...	...	
8				0·05	...	0·05	
9				0·97	...	0·97	
10				...	...	...	
11				...	...	...	
12				...	...	...	
13				...	...	...	
14				0·05	...	0·05	
15				0·04	2·08	2·12	
16				...	...	...	
17				...	...	...	
18				0·23	...	0·23	
19				...	...	...	
20				0·58	...	0·58	
21				0·04	...	0·04	
22				...	...	...	
23				1·00	0·02	1·02	
24				...	...	...	
25				...	0·30	0·30	
26				0·85	...	0·85	
27				0·83	...	0·83	
28				...	...	...	
29				...	0·04	0·04	
30				...	...	...	
31				...	...	...	
Total						7·13	
Means							

H. C. PAXON,
Observer.

Pahang.

Abstract of Meteorological Readings in the various Districts of the State for the month of September, 1904.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
Kuala Lipis ...	...	...	...	...	...	...	...	...	...	...	...	...	...
Raub ...	..	...	...	...	...	...	...	...	...	...	...	...	...
Bentong ...	...	...	...	...	...	...	...	...	...	...	...	...	...
Pekan ...	...	...	...	...	...	...	...	...	...	...	...	...	...
Sungei Lembing ...	...	...	...	...	...	...	...	...	...	...	...	...	...
Kuantan ...	...	...	...	87·0	70·0	17·00	...	...	...	...	...	1·85	0·38

KUANTAN,

7th October, 1904.

Meteorological Observations taken at Kuala Kuantan, Pahang, during the month of September, 1904.

Date.	Temperature of Air. Maximum.	Minimum.	Range.	Rainfall. 6 A.M.	6 P.M.	Total.	Remarks.
1				...	...	...	
2				...	...	...	
3				...	...	...	
4				...	...	...	
5				·10	·27	·37	
6				..	..	...	Records as on day of measurement.
7				...	...	..	
8				...	...	...	
9				..	...	...	
10				...	·20	·20	
11				...	·18	·18	
12				...	...	...	
13				...	...	...	
14				·15	...	·15	
15				...	...	...	
16				...	...	...	
17				...	...	...	
18				...	...	...	
19				...	...	...	
20				...	...	...	
21				·17	...	·17	
22				...	...	...	
23				...	...	...	
24				...	...	...	
25				...	...	...	
26				·15	...	·15	
27				·25	...	·25	
28				·38	...	·38	
29				...	...	...	
30				...	...	...	
31				...	...	...	
Total						1·85	
Means							

H. C. PAXON
Observer.

Muar.

Abstract of Meteorological Readings in Muar for the month of September, 1904.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
Lanadron Estate ...	...	...	85°	91°	70°	21°	76°	...	...	...	...	6·52	2·13

Muar, 4th October, 1904.

ROGER PEARS.

Kelantan.

Abstract of Meteorological Readings in Kelantan for the month of September, 1904.

District.	Temperature.			Rainfall.	
	Mean Maximum.	Mean Minimum.	Mean Range.	Total Rainfall.	Greatest Rainfall during 24 hours.
	°F	°F	°F	Inches.	Inches.
Kuala Lebir ...	89·9	70·3	16·6	6·53	1·34

Kuala Lebir, 2nd October, 1904.

JOHN D. GIMLETTE.

METEOROLOGICAL OBSERVATIONS.

Table Showing The Daily Results Of The Reading Of Meteorological Observations Taken At The General Hospital, Seremban, For The Month Of August, 1904.

Date.	Temperature of radiation.						Temperature of radiation.				Wind.		Temperature of evaporation.			Computed vapour tension.			Relative humidity.			Clouds 0 to 10.			Cloud and weather initials.			Rain.
											Direction.																	
	9 H	15 H	Mean.	Maximum.	Minimum.	Range.	Sun.	Difference sun and shade.	Grass.	Difference shade and radiation.	9 H	15 H	9 H	15 H	Mean.	9 H	15 H	Mean.	9 H	15 H	Mean.	9 H	15 H	21 H	9 H	15 H	21 H	Inches.
	°	°	°	°	°	°	°	°	°	°			°	°		in.	in.											
1	78	78	78	82	71	11	100	18	65	6	S.E.	S.W.	72·9	72·9	72·9	0·810	0·810	0·810	84	84	84	3	5	3	C	C	C	1·60
2	75	78	76·5	84	71	13	110	26	65	6	S.E.	S.W.	75	72·9	73·9	·868	·810	·839	100	84	92	10	2	2	R	B	B	·75
3	82	82	82	87	71	16	150	63	65	6	S.E.	S.W.	75·3	75·3	75·3	·877	·877	·877	80	80	80	3	0	0	C	B	B	
4	82	84	83	88	71	17	150	62	65	6	S.E.	S.W.	75·3	77·4	76·3	·877	·938	·907	80	80	80	2	0	0	B	B	B	
5	80	84	82	88	71	17	160	72	65	6	S.E.	S.W.	75	77·4	76·2	·867	·938	·902	85	80	82·2	0	0	0	B	B	B	
6	80	84	82	88	72	16	160	72	65	7	S.E.	S.W.	75	77·4	76·2	·867	·938	·902	85	80	82·5	0	0	0	B	B	B	
7	82	84	83	88	72	16	160	72	66	6	S.E.	S.W.	77	77·4	77·2	·926	·938	·932	85	80	82·5	0	0	0	B	B	B	
8	80	84	82	88	72	16	160	72	66	6	S.E.	S.W.	75	77·4	76·2	·867	·938	·902	85	80	82·5	0	0	0	B	B	B	
9	80	84	82	87	72	15	150	63	66	6	S.E.	S.W.	75	72·4	73·7	·867	·794	·830	85	68	76·5	0	0	0	B	B	B	
10	80	84	82	87	70	17	160	73	65	5	S.E.	S.W.	75	74	74·5	·867	·840	·853	85	72	78·5	0	0	0	B	B	B	
11	82	84	83	88	71	17	160	72	65	6	S.E.	S.W.	75·3	77·4	76·3	·877	·938	·907	80	80	80	0	0	0	B	B	B	
12	82	84	83	88	69	19	160	72	65	4	S.E.	S.W.	75·3	77·4	76·3	·877	·938	·907	80	80	80	0	0	0	B	B	B	
13	80	82	81	87	70	17	160	73	65	5	S.E.	S.W.	75	75	75	·867	·867	·867	85	85	85	2	0	0	B	B	B	
14	78	80	79	85	70	15	110	25	65	5	S.E.	S.W.	72·9	71·6	72·2	·810	·775	·792	84	75	79·5	5	3	3	C	C	C	
15	78	81	79·5	85	70	15	120	35	65	5	E.	E.	72·9	72·6	72·7	·810	·802	·806	84	76	80	3	2	3	C	B	C	
16	78	82	80	88	72	16	150	62	65	7	N.E.	E.	71·2	73·6	72·4	·765	·830	·797	79	76	77·5	0	0	2	B	B	B	
17	74	86	80	88	70	18	163	75	65	5	E.	S.	68·8	71·2	70	·755	·763	·731	84	61	72·5	3	0	0	C	B	B	
18	77	87	82	88	71	17	161	73	65	6	S.E.	S.W.	68·5	68·9	68·7	·697	·708	·702	75	55	65	2	0	0	B	B	B	
19	78	82	80	88	71	17	161	73	65	6	S.E.	S.E.	67·8	72	69·9	·681	·785	·733	71	72	71·5	0	2	0	B	B	B	
20	76	85	80·5	85	70	15	115	30	65	5	S.E.	S.E.	69·2	70·1	69·6	·713	·738	·725	79	61	70	2	0	0	B	B	B	
21	78	83	80·5	84	70	14	141	57	65	5	S.E.	S.W.	72·9	70·3	71·6	·810	·742	·776	84	68	76	0	2	2	B	B	B	
22	75	85	80	86	70	16	167	81	65	5	E.	E.	69·8	71·8	70·8	·731	·781	·756	84	64	74	3	0	0	C	B	B	
23	78	82	80	84	71	13	155	71	65	6	E.	N.E.	72·9	72	72·4	·810	·785	·797	84	72	78	0	2	0	B	B	B	
24	76	78	77	86	72	14	105	19	65	7	N.E.	S.E.	74·3	76·3	75·3	·848	·906	·877	94	94	94	2	3	2	B	C	B	
25	78	82	80	84	71	13	110	26	65	6	E.	S.E.	72·9	73·6	73·2	·810	·830	·820	84	76	80	0	0	0	B	B	B	
26	78	77	77·5	82	72	10	158	76	65	7	S.E.	S.W.	72·9	75·3	74·1	·810	·877	·843	84	94	89	2	5	0	B	C	B	·87
27	76	75	75·5	85	70	15	155	70	65	5	E.	N.W.	74·3	69·8	72	·848	·731	·789	94	84	89	5	10	2	C	R	B	
28	79	83	81	85	72	13	125	40	65	7	N.W.	S.E.	72·3	74·7	73·5	·793	·856	·824	80	76	78	5	10	5	C	R	C	·31
29	76	82	79	84	72	12	125	41	65	7	S.E.	S.E.	74·3	73·6	73·9	·848	·830	·839	94	76	85	5	5	3	C	C	C	·09
30	76	83	79·5	84	72	12	113	29	65	7	S.E.	S.E.	72·6	68·4	70·5	·801	·693	·747	89	52	70·5	2	3	2	B	C	B	
31	78	86	82	87	70	17	165	78	65	5	S.E.	S.W.	72·9	69·2	71	·810	·721	·765	84	58	71	2	2	2	B	B	B	
																												Total 3·62

STATE SURGEON'S OFFICE.

Seremban, 20th September, 1904.

J. SHEPLEY PART, M.D.,

Acting State Surgeon.

No. 10.] OCTOBER, 1904. [VOL. III.

AGRICULTURAL BULLETIN

OF THE

STRAITS

AND

FEDERATED MALAY STATES

EDITED BY

H. N. RIDLEY, M. A., F. L. S.,

Director of Botanic Gardens, S. S.

CONTENTS.

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NOTICE.

THE SCIENTIFIC AND TECHNICAL DEPARTMENTS OF THE IMPERIAL INSTITUTE.

His Excellency the Governor has received a despatch from the Right Hon'ble the Secretary of State for the Colonies calling attention to the advantages offered by the Imperial Institute to Merchants, Planters and others, who may wish to have samples submitted to scientific experts for opinion as to their commercial value, &c. The following extracts from a Memorandum published by the Authorities of the Imperial Institute will give an idea of the work undertaken and carried on there.

"The Scientific and Technical Department of the Institute has "been established to acquire information by special enquiries and "by experimental research, technical trials and commercial valua- "tion regarding new or little known natural or manufactured pro- "ducts of the various Colonies and Dependencies of the British "Empire and of Foreign Countries, and also regarding known "products procurable from new sources, and local products of "manufacture which it is desired to export. This work is carried "out with a view to the creation of new openings in trade, or the "promotion of industrial developments."

2. In an extensive and well equipped series of Research Laboratories, a numerous staff of skilled chemists under the direction of Professor WYNDHAM R. DUNSTAN, M.A., F.R.S., carry out the investigation of the chemical constitution and properties of new dye-stuffs, tanning materials, seeds and food-stuffs, oils, gums and resins, fibres, timbers, medicinal plants and products, with a view to their commercial utilization. Whenever necessary these materials are submitted to special scientific experts, by whom they are made the subject of particular investigation or practical tests. Reports are also obtained from technical or trade experts in regard to the probable commercial or industrial value of any such products, while full information is collected from official or other trustworthy sources regarding the probable extent and cost of available supplies.

Reports on the results of enquiries or experimental investigations are supplied as a rule, without charge, but should special expenses be incurred in connection with any such reports, or with the commercial value of particular materials or manufactured products, which the Council do not consider themselves warranted in meeting, a statement of such outlays will be furnished, for repayment, when the Reports are supplied. Should an investigation or report of exceptional character be asked for by a Government Department, an estimate of the attendant expenses will be submitted, with a view to ascertain whether authority for such expenditure will be given.

3. The Federated Malay States Government has undertaken to grant a sum of £100 a year for 5 years to the Department with a view to the careful investigation and commercial development of the mineral resources of the States.

The Government Geologist is collecting specimens for chemical examination and after analysis the Imperial Institute which is in very complete touch with the principal manufacturing and other industries of the United Kingdom, will bring the specimens before manufacturers and others for trial with a view to their commercial development.

It is expected that this action will do much to help in finding a market for new products and developing the markets for those already exploited.

AGRICULTURAL BULLETIN

OF THE

STRAITS

AND

FEDERATED MALAY STATES.

No. 10.] OCTOBER, 1904. [Vol. III.

MANURING RUBBER.

PLATE.

We give this month a photograph showing the effects of various manures on young plants of Para rubber, *Hevea braziliensis*. The first line from the right is manured with burnt earth; the next by which the cooly is standing, is manured with cow-dung; the next one a mixture of cow-dung and burnt earth, the others poudrette and lime respectively. There is no question as the photograph shows that manuring by cow-dung is by far the best, and that burnt earth and leaves comes next. Lime seems absolutely injurious. These experiments were made first in pots before being made in beds and exactly the same result obtained.

Cow-dung is usually too expensive to use on estates on any large scale, but a little might well be used on the nursery beds, to stimulate more rapid growth. Experiments are now being tried to discover whether full grown trees give more latex when manured with cow-dung, but these will take a considerable time.—*Editor.*

FIBRE PLANTS.

(*Continued*).

Pandanus.—There are a number of different species of Pandanus wild in the Malay Peninsula, the leaves of which as is well known are in request for ataps, mats, bags, hats, kajangs, etc. Almost any of the large leaved kinds can be used for thatching ataps, mats, etc., but the one chiefly used for these purposes is *Pandanus fascicularis*, a common sea-shore plant also cultivated often in villages. For the kajangs (ox cart covers) and hats the very large leaves of *Pandanus atrocarpus* is used.

Lately Mr. SCHIRMER whose fibre exhibit at the recent Agricultural Exhibition attracted so much attention, experimented with the Hogan Machine on the leaves of Pandans. It did not seem

from the appearance of the leaf that the fibre would prove of any value. Leaves of *Pandanus fascicularis*, and *P. Kaida* and also of *P. helicopus*, the Resau were tried. All unexpectedly produced a fair or good fibre. Further samples were made especially of that of the Resau, and samples sent to the firm of Behn Meyer & Coy, in Hamburg. On this it was reported: "There will be a good demand for this fibre, estimated value for 50 Kos 19 to 20 marks ex quay Hamburg. The valuation works out to about $9.75 per pikul free on board Singapore.'

Messrs. RIEBOW of Hamburg also says of it "Hemp equal to sample, provided whiter in colour and better cleaned, values about £22-24 a ton. The Hemp should not be twisted or in tresses but should best be packed in such a way in about 2 kilos a bundle, tied up at one end with a string of the material itself and packed in even layers, pressed and sewn in linen bales of about 150 to 200 kilos each. The sample shows a quality similar to Mauritius hemp the value of which to-day is about £28 to 38."

A. JANTZEN reports "In case fibre could be better cleaned and be procured in length of 5 to 7 feet, these advantages would make a valuation much easier than it is with the present sample."

A very great drawback to be considered is the very small resistive power of the fibre: should it be possible to make the fibre absolutely tough so that it might resist a heavy strain large quantities could certainly be placed.

My valuation for a quality equal to your sample	£12
better cleaned	£18 to 20
equal to my sample	£34 to 35"

Messrs. FELTEN and GUILEAUME report:—Provided the colour were throughout as white as part of the sample it may perhaps be possible to use the fibre as a substitute for inferior Mauritius hemp with the exception, however, that your sample shows a much weaker fibre and (is one which) possesses almost no strength.

The Hamburg firm (Behn Meyer) writes on these reports that the great defect seems to be the very small resistive power of the fibre. According to your (Mr. SCHIRMER'S) report there would not be much difficulty in obtaining better cleaned hemp, and a whiter colour. I have telegraphed transmitting not too high a valuation as I know by experience that high valuations are always likely to be given only with a view of securing the business.

The Resau is a river pandan which occurs in vast beds in the rivers of Johor and Sumatra as well as elsewhere in the Peninsula. In the rivers it is a positive nuisance, blocking them up with their creeping stems so that in many places it is necessary to keep the river open by cutting the plants away. One often has to travel for miles between the great walls of a dense mass of this plant

which attains a height of thirty or more feet tall. The supply of leaves from such a spot would be endless, and if a manufactory of fibres from the leaves could be started in such spots, it would doubtless pay very well and help at the same time to keep down a nuisance.

Besides this plant we have also the common seashore *Pandanus fascicularis* (Pandan Duri) so abundant everywhere. The leaves of this are quite long enough for fibre purposes, and could readily be used in any quantity. It can be easily grown from cuttings in damp low-lying ground, and might also be grown as a low hedge plant to keep out cattle, etc.

Pandan Mat-bags.—Mr. SCHIRMER was awe-struck at the Agricultural Show by the appearance of the mat bags made out of the leaves of *Pandanus fascicularis*, which are familiar to all as being commonly used by the Malays for carrying rice, etc. Similar mat bags are used in Mauritius for sugar, but the demand there has been so great that the supply of pandans, known there as Vacoa, is practically worked out. There is a demand there for two million and a half of these bags a year, and there seems to be certainly an opening here for a big business in them.

It would be necessary that they should be made cheaply and some plan of compressing them for export to avoid excess of freight would be required. There is sailing ship communication between Singapore and Mauritius, and it may be hoped that the Malays in the Peninsula will be induced to make these bags on a large scale for export. Samples of the bags as used in Mauritius have been sent to the Botanic Gardens to show what is required.

Other fibres.—Mr. SCHIRMER has kindly put at my disposal extracts from letters from the Messrs. RIEBOW of Hamburg, experts in the fibre trade as to samples of the fibres he has sent to them, prepared by the new Machine. Messrs. RIEBOW is having the samples valued, but at present he gives the following as prices which they would probably realize.

Aloe (*i.e. Fourcroya*) commonly known here as Mauritius hemp £30, Murva £35, Pine-apple £30-35, Pisarig £25 for 1,000 kilos ex quay Hamburg, with usual allowance on weight and discount, pressed in bales of about 200 kilos, packed in straight folds. The cleaner and whiter the goods and the longer the fibre the better will be the prices they fetch.

Of Murva fibre he says:—"The quotation of hand made (£50) seems to me too high. *Sanseviera* well cleaned of good colour, length and strong is wanted here *in very keen demand* and *big quantities.* The price of Ramie is about £30, there is a good market for it. Aloe (Mauritius) fibre quotation to-day £29 to 32.

Pine-apple £20 to 35 according to length."

MANILA HEMP.

L. & J. RIEBOW, Telegrams, Hanfriebow, Hamburg.

Price end of year.			Production during year.	Consumption during year.	Stock in Manila end of year.
1903	M 39	8⅛—9¼ cts.	900,000	1,030,000	108,000
1902	36	8¼—8¾ ,,	900,000	792,000	153,000
1901	46	11⅛—11¼ ,,	760,000	898,000	108,000
1900		7¼—7¾ ,,	921,000	673,000	227,000
1899		11⅜—14½ ,,	493,000	795,000	3,000
1898		6⅛—6¼ ,,	730,000	855,000	120,000
1897		4—5 ,,			
1896		4⅛—4¼ ,,			
1895		4¼—4⅜ ,,			
1894		4—4½ ,,			
1893		5⅛—5¼ ,,			
1892		6½ ,,			
1891		6¾—7¼ ,,			
1890		9½ ,,			

bales of about 250 lbs.

MURVA FIBRE.

We understand that a firm in Singapore has just received an order from San Francisco for 500 tons of "Nanasfibre" the price offered being 3*d.* a pound, the fibre to be not less than 30 centimeters in length. This so called "Nanas fibre" from Java is not as might be supposed pineapple fibre. Mr. SCHIRMER who has seen its cultivation and preparation in Java says it is nothing else than Murva fibre which is grown and hand prepared in the Java Hills.---*Editor.*

AGAVES AND FURCROYAS.

The *Agaves* are *Amaryllidaceous* plants, natives of Southern North America and the West Indies. Several of them have been

introduced to all parts of the world as ornamental plants and many grow well or fairly well in the Straits. There is a very large number of species of *Agave*, but of these only a few have any value as fibre plants. Twenty different kinds were experimented with in 1891, in Washington with a view of discovering which produced good fibre. The plants were, however, all greenhouse plants and it may be assumed that the fibre would not be as strong as in wild plants. The greater number of these produced fibre of no use for trade purposes.

The two best of these plants in cultivation in the Straits are the American Aloe (*Agave Americana*) and Sisal Hemp *Agave rigida var. Sisalana*.

Agave Americana is easily known by its thick grey leaves, an ornamental white edged variety is also often grown in gardens.

It is propagated by suckers and when it flowers often produces bulbils as do the other species in the axils of the flower spikes from which it can be readily reproduced. Like all the group it perishes after flowering though the lateral suckers usually continue to grow as independent plants.

The leaves when full grown attain a length of 3 to 4 feet or more, but the plant has a somewhat slow growth in most parts of the Peninsula, and does not seem to develop to as large a size as it does in America. This is probably due to the wetness of the climate, as if planted in very damp shady spots it is apt to become stunted and make very slow growth. In hot dry open places especially on rocky and gravelly soil it does much better.

Leaves grown in Singapore were put through Mr. SCHIRMER's machine and gave excellent results, the fibre coming out strong white and clean. The fibre has a good reputation and valued at £30 to £40 per ton. It takes colour easily, is light and very elastic. In India it is said to be superior in strength to coir, jute or some hemp. The absence of a good preparing machine seems to have been the sole reason that this plant has not been more extensively cultivated for its fibre. In good localities it is fit to crop in about three years. Only the four or five lower leaves are cut from each plant as a rule, but as long as three uppermost leaves are left, the plant continues to thrive.

The plants are set 5 feet apart so that about 2,000 plants can be grown in an acre. From shoots or suckers they take from 5 to 6 years before they can be cropped. It requires a light and dry soil, and needs neither manuring nor ordinary weeding. The out-turn per acre in India is about 40 to 70 tons of leaf per year, giving 1½ tons of fibre. It is used for cordage, twine carpets, and in the Azores for lace.

Agave rigida var. *sisalana*.—This is a native of Mexico and is probably the best of the fibre Agaves. The fibre is of high quality

and there have been extensive cultivations of it in the West Indies. A leaflet dealing with the cultivation of this species in the Lalbagh, Bangalore, has recently been published by Mr. CAMERON of the Botanic Gardens there. Five thousand plants were introduced from Florida in 1892 and poling (flowering) commenced in 1901. Each flower pole produced upwards of 2,000 bulbils. The soil recommended is loose, stony and poor ground. The plant grows larger in rich land but the fibre is less in quantity and quality. Plants have long been cultivated in the Singapore Botanic Gardens, but they seem of very slow growth. Perhaps the country is too damp for it or our stiff clayey soil does not suit it. It might do better in the hills of Penang and Province Wellesley.

L. & J. RIEBOW, Telegrams. Hanfriebow, Hamburg.

Consumption of Sisal hemp—practically covering the production of this commodity:—

1903	100,000 tons.	1895	55,000 tons.
1902	90,000 ,,	1894	54,000 ,,
1901	85,000 ,,	1893	50,000 ,,
1900	81,000 ,,	1892	56,000 ,,
1899	80,000 ,,	1891	46,000 ,,
1898	60,000 ,,	1890	36,000 ,,
1897	72,000 ,,	1889	38,000 ,,
1896	60,000 ,,		

SISAL IN YUCATAN.

Henequen, or sisal hemp, is grown in Yucatan, in this Consular district, at an elevation of from 28 to 100 feet above sea level on a strip of country generally calculated to be about 40 miles from the sea inwards, in which zone the temperature ranges from 45° to 100° Fahr. with a mean of about 85°. The plant from which this fibre is produced is of the family of the Americans agave. It flourishes on arid land where the soil is very thin, resulting in the strength of the plant being driven into the leaves instead of the roots, while the roots appear to run along the surface, and from these the shoots are produced and in turn planted. It is very hardy, producing the whole year round, and from the time of first giving fibre, when about six years old, continues producing leaves for from 12 to 18 years.

It may be taken that 1,000 leaves at maturity give from 40 to 60 lbs. of fibre, and on the cutting of these the life of the plant depends for, if they are not cut, the plant will pole before time, and once poled the hemp becomes dry, if not entirely useless. The time for cutting the leaves is when they are at right angles to the stem. Weeding is necessary every year, about a month before the rainy season begins, so that the plants may have all the advantage of the rain, and at the same time new shoots are planted. Shoots are cut from the plants at from two to three years of age. The purchaser, if wishing these for use out of the State, would have to pay about 80 dollars per 1,000 in addition to the cost of cutting and other charges, as well as a heavy export duty. And purchasers have been known to wonder why they would not grow, not being aware that the grower has been known to boil the shoots to prevent competition in other lands. The leaves are, when ready for cutting, about 5 feet long. After they are cut the thorns on both edges and the hard point or needle are removed, the leaf then being passed through a cleaning machine and the fibre when extracted is dried and bleached in the sun. It is then ready for export, and put up in bales of about 160 lbs. In 1884 the State of Yucatan exported 233,311 bales, in 1894, 373,833 bales, and in 1903, 590,430 bales.

The principal purpose for which the hemp is used is the manufacture of rope and binder twine. It is generally mixed with some manila, which is longer and somewhat better. Some of the hemp is shipped to Europe, but the great bulk of it is sold in the United States. The machinery employed for preparing hemp or sisal grass for the market, comes almost entirely from the United States. The growers have all become enormously wealthy, many of them being millionaires. Roughly speaking, what costs one dollar to produce sells for four dollars.

The exports during the last five years were :—

Year.	Quantity.
	Bales.
1899	445,978
1900	499,626
1901	517,519
1902	528,246
1903	590,430

The following table shows the countries which took the amount exported during 1903:—

	Quantity.
	Bales.
United States	575,167
Cuba	8,066
United Kingdom	4,286
Canada	1,200
France, Spain, Germany & Belgium	1,711

(Mr. CONSUL LEAY'S report on Vera Cruz for the year 1903. p. 24.)

RUBBER NOTES.

In Mr. PEARSON'S interesting account of his experiences in travelling through Ceylon and the Peninsula published in the *India Rubber World*, he accredits the Editor with saying that he took 900 pounds of rubber from 100 trees in one season, and three pounds from a three-year old tree. As this statement has found its way into one or two other journals and is not quite accurate, it requires a little emendation. The statement implies that it was the trees of the Botanic Gardens which supplied these exceptional amounts. The first statement, *viz.*, that 100 trees gave an average of 9 pounds per tree. This did not refer to the Garden's trees, but to those of an estate in Perak. From 9 to 12 lbs. have been taken from a number of trees in several places in the Peninsula, but planters must not be so sanguine as to expect to get such returns always. The three pounds from a single three-year old tree was taken many years ago from a tree in Kwala Lumpor, an isolated tree, I believe, in the hospital grounds, but I cannot lay hands on my original note of this. One of these trees was reported to have grown to a height of thirty feet in eighteen months from seed. Of course as all planters know some trees occasionally give extraordinary and exceptional results, but these though interesting are not of so much practical importance as the lower figures of average results.

Rubber in French Indo-China.—Dr. HAFFNER of Saigon Gardens publishes in the Bulletin Economique for August tables of growth of Para trees in the Experimental Gardens of Ong Lem with a photogravure of a row of trees 5½ years old. The trees are planted

in three classes of ground, one damp but drained, and giving traces of moisture in the dry season at a depth of 60 centimeters. A similar soil but a little higher ground and a less sandy place where in the dry season moisture is only met with at from 6 to 10 meters deep. From the figures and photograph it appears that the trees make a very fair growth, in all these soils and those in the very dry soil are not apparently appreciably behind the others.

Manihot Glaziovii has failed and its cultivation given up. *Ficus elastica* grows well but the plants are young as yet. Experiments in the use of the Gutta percha of *Dichopsis Krantziana*, a plant allied to our *D. obovata* for cable purposes, are being made by the Minister of Post and Telegraphs, who seems to think it may do well. This gutta, however, as imported into Singapore has a very poor reputation I am informed.

Rubber in Sierra Leone.—The annual colonial report while recording a small increase in the export of rubber from Sierra Leone last year gives a table of exports of previous years showing a steady fall from 13,316 cwts. in 1896 to 952 cwts. in 1903. This rubber is chiefly obtained from *Landolphia owariensis,* a rubber vine which has long been cultivated in the Singapore Botanic Gardens, but makes a somewhat slow growth. Its rubber last year fetched 3/8–3/8½ per pound, a rise of a shilling a pound on that of the previous year.

On the Gold Coast Para rubber and Funtumia cultivated in the Government Gardens at Aburi gave good results, the Para rubber being reported on by English brokers as good as that of Ceylon. It is thought that the soil on the North West frontier is suitable for cultivation, and the natives are being stimulated to plant it. Castilloa does not seem to be satisfactory.

Artificial Rubbers.—Those planters and rubber dealers who are apt to get scared over rumours of the discovery of cheap artificial rubbers would do well to read an article on the subject in the India-Rubber Journal for October of this year where a number of these hoaxes are described. Among them is a story of an inventor who made it from "some grass in the East Indies where it could be procured in vast quantities for the price of cutting it" (doubtless Lalang). His samples were excellent, but unfortunately they proved to be genuine imported Para rubber, and the mess he made with the grass was a different thing altogether. Other "rubbers" consisted of tar and boracic acid, and such like things, yet it appears that there are manufacturers who pay large sums to inventors for these kinds of inventions and would-be planters who are scared at them.

Rubber at the St. Louis Exhibition.—The Ceylon rubber exhibit at this show is noted in the *India Rubber World* as not large, but particularly fine, consisting of 200 discs which were easily the best crude rubber ever seen in the United States. Mr. H. C. PEARSON interviewed the high officials of the Exhibition and got a letter sent

to the Chairman of Agriculture calling attention to the importance of this exhibit.

Ceylon planters seem to know the way to advertise their produce and get a good reputation for it. We wonder when the Federated Malay States planters will follow suit. It does not appear that any samples were sent to the Exhibition by them, although there does not seem any reason why a big show should not have been sent from this country. Meanwhile Ceylon with a smaller area of plantations and rubber which is certainly no better than that of the Native States is getting its rubber well known all over the world by persistently and thoroughly advertising, and no one hears much about Malay Peninsula rubber.

A new Tapping Punch.—Mr. FREUDWEILER of Bila, Sumatra, has invented an useful punch for tapping trees. This tool is a cast steel instrument about eight inches in length. With a round handle, and an enlarged portion at the other end flattened and 1½ inches across which is narrowed to a double cutting edge of strong steel something after the manner of a compressed wadpunch. The instrument is used with a hammer so that a strip of bark three-sixteenths of an inch wide and an inch long can be punched out readily and cleanly, and can be removed through a square space behind the cutting portion. One advantage of this tool is that the cutting edge does not penetrate the wood, which can readily be felt when the handle of the tool is struck. It can be used very quickly, and with a little practice makes a good clean cut of the size required. It is especially suitable for old trees which have thick or rough bark but can be used for any younger ones.

Messrs. JAEGER & CO. are agents for this tool.

RUBBER IN THE MALAY PENINSULA.

The fame of the rubber planting industry of the Malay Peninsula is spreading, and we find letters and information on the subject in various quarters. We cull the following notes from home papers, the second letter being in the *Aberdeen Free Press*. Of the first notes the writer is presumably a Ceylon planter who has recently visited the Federated Malay States. He signs himself "Peripatetic Planter," and says: "Now that a good deal of attention is being drawn to this part of the world and its rubber producing capabilities, a few impartial words on the subject from a planter of another country who has been visiting the place may be of interest. The industry is quite in its infancy. Only one estate to my knowledge has yet started sending rubber to market in commercial quantities; many important points relating to the real value of the business are so far merely matters of conjecture. Still, if things turn out right, and prices only remain as they are, the planters are *justified in the great expectations* they have for the future. The best rubber has recently been selling at 5*s.* and more per lb., a truly phenomenal price, when one considers that ivory

gets only twice as much. The rocks ahead are the possibility of some imitation being manufactured that would ruin the market, and the more probable possibility of some blight, canker, or fungus attacking the plants, and if not killing them, spoiling their rubber-producing capacity. All Ceylon men know how a large area of one kind of cultivation tends to produce disease, which, in a climate such as this, where there are no marked season to check its ravages, may absolutely ruin everything. So far, however, white ants are the only serious enemies that have been found. *The Process of Manufacture* is exceedingly simple, but as it has hardly yet advanced beyond the experimental stage, the planters do not know what difficulties they may have to contend with when called upon to produce 400 or 500 lbs. a day, as they would have to do if they are going to pay the £30 or £50 profit per acre, to which they aspire. And against their doing this I honestly see no insurmountable barrier so far, but we must not forget that these figures are based entirely on the results of experiments on a small scale, nobody yet having a large area of tapable trees, but it appears from the data we have to go on that an acre of land may reasonably be expected to carry 150 trees, each of which at six years old, should give one pound of rubber annually. With rubber at present prices this means a gross production of nearly £40 per acre. Expenses should not be heavy, manufacture would cost little, and cultivation nothing. I should be inclined to advise *Intending Investors* to wait another year or two, by which time many places will be in bearing, and the real possibilities of the enterprise established. One thing that appears evident is that Para rubber grows better here than in Ceylon, and much Ceylon money and energy is being brought into this country. As to getting good land, there is plenty of land to be had, but you have to go a long way off for it now. Practically all the good land that is well situated has been taken up, but could be bought from the owners at a price. The country is very *Insufficiently roaded*, and the difficulties of establishing an estate in the middle of the jungle without a road can only be appreciated by those who have tried to do it. There are two chief classes of land, on both of which rubber appears to grow equally well. (1). The high land, a red or yellow soil, chiefly laterite in various forms of decomposition, and (2), the alluvial, black clay land on the sea border. Both kinds have their advocates, but on the principle that the richer soil should give the better results I should prefer the alluvial.

Mr. RUTHERFORD writes:—"In a recent issue of your paper there appeared an interesting article on 'The Cultivation of the Rubber Tree.' While the writer justly praised the quality of the cultivated 'Para' rubber from Ceylon, I would desire to point out that the opinions expressed with regard to cultivated rubber from the Malay Peninsula are not quite consistent with the facts. The writer says:—"In many other British possessions situated in or near the tropics the conditions are suitable for rubber cultivation, and considerable success has attended its introduction into the Malay Peninsula, but, although the produce has been satisfactory in

quantity, some doubts have been cast upon its quality. It appears to differ essentially from the best Para rubber, but whether this is an inherent peculiarity due to the soil or climate, or age of the trees, or merely to the treatment it receives in preparing it for the market, has yet to be determined." As a matter of fact, 'Para' rubber from the Malay Peninsula fetches prices equal to the best Ceylon, and about 10 per cent. over 'Para' rubber from the Amazon. Last month cultivated rubber from the Bukit Rajah Rubber Company's estate in the Malay Peninsula fetched the wonderful price of 5/7¼*d.* per lb., a price which it is believed has never been reached by rubber from uncultivated trees from any country in the world. If any doubts have been cast upon the quality of rubber from the Straits, as the "Field" correspondent indicates they should be set at rest by the opinion of Dr. WEBER, the greatest living authority on rubber. The following is his analysis and opinion of this rubber, which sold for 5/7¼*d.* per lb., and I may here say that in my opinion all the plantations of cultivated rubber in the Malay Peninsula are likely to give equally good results:—

This rubber was prepared from 6½-year old Hevea trees on the Sungei Bengai division of the Bukit Rajah Company's estates. The sample contains:—

India Rubber	95·37	per cent.
Resinous extracts	3·02	,,
Albuminous matter	1·24	,,
Mineral matter	0·37	,,
	100.00	

The sample was free from moisture. The rubber is extremely strong, and its vulcanising properties are fully equal to those of pure 'Para', indeed the vulcanised product is nearly 10 per cent. higher in tensile strength than a sample of commercial fine Para cured side by side with it.

I have, etc.,

H. K. RUTHERFORD.

(The Tropical Agriculturist Vol. XXIV, p. 366.)

CEYLON RUBBER, ITS PREPARATION AND IMPROVEMENT.

THE CONSUMER'S VIEW.

Mincing Lane, London, E. C.

30th August, 1904.

To the Editor.

Dear Sir,—We are duly in receipt of your favour of the 12th instant, respecting Ceylon-grown Para Rubber and its preparation, &c., by Ceylon planters. In the first place this rubber has not come yet in sufficient quantities to prove what it is worth to the

manufacturers compared with fine Para, and the small lots that have been sold at extreme prices, usually 3*d.* to 6*d.* per lb., above the price of fine Para have been bought for a special purpose and not for manufacturing purposes generally. It is quite a question whether it will realise any more than fine Para when it comes in large quantities, and it has yet to establish its character before its relative value can be ascertained. As long as it is only in very small supply it will bring anything like 3*d.* to 6*d.* per lb., over fine Para, as the present users of it could not take very much of it for their special purposes, and we expect to see the price in the near future about the same as fine Para—some say below it. With regard to the preparation and the use of acids, its purification from resin, etc., we can only say that the less acid or chemical treatment, the better—and, of course, the purer the rubber is and the less resin it contains, the more valuable it must naturally be to the manufacturers.

Manufacturers hate the idea of any chemical treatment, and are very shy of buying any rubber that has a suspicion of acid, or having been specially treated. They prefer to receive the crude article and treat it for themselves. Using acid is very dangerous, as it may spoil a manufacturer's goods. All the manufacturers want is a good, pure article, and the one that loses least in manufacture will command the best price.

As to colour, this is of no importance, and in trying to make it pale, you may spoil it altogether. The thickness of the biscuits is also of no importance, and if thick biscuits can be cured and dried as well as thin, which we very much doubt, they would fetch as much as thin.

As to vulcanising the rubber and colouring it, we should say no action could be thought of more fatal to the industry than for planter to treat their produce in such a manner, and nothing would be more resented by the manufacturers: it would be very unwise and suicidal experiment.

In conclusion, we do not think any possible improvement can be suggested to surpass the splendid quality of among others, such estate as Culloden, Tudugalla and Heatherley, which are as near perfection as possible. Let those in doubt take these marks as their example.

I have, &c.,

LEWIS & PEAT.

(The Tropical Agriculturist November 1st, 1904. p. 308.)

Analysis of "5*s.* 7¼*d.*" Ceylon Rubber.

95½ Per Cent Caoutchouc.

The samples of Ceylon cultivated Para rubber, which obtained the record recently of 5*s.* 7¼*d.* per lb., have been analysed at home. This analysis shows the true worth of the rubber which was re-

ported as free from moisture, very strong, and vulcanising well. It will be remarked that the percentage of resins and albuminous matter was very small, and the amount of mineral matter present almost nil. The analysis shows the rubber to be composed as follows:—

Caoutchouc	95·50	per cent.
Resins, etc.	3·00	,,
Albuminous matter ...	1·25	,,
Mineral matters	0·25	,,
	100·00	

This is a splendid analysis and a matter on which Ceylon planters have to be congratulated, as few rubbers can show such a high percentage of caoutchouc or pure rubber, and so little resins, &c. This analysis will be read with much interest by rubber-growers, showing the constituents of the rubber to be about as perfect as the raw article can show.

The Tropical Agriculturist, Vol. XXIV, p. 328.

EXPLOITABLE SIZE FOR BAKAU SWAMPS.

In the Dindings Bakau forms one of the chief items of Revenue, but is now completely worked out owing to indiscriminate and unsystematic fellings.

It takes about 12 years to step into the pole stage and in another 8 years reaches a 6-inch diameter. Bakau begins with a conical bole and attains cylindricity with the completion of the pole stage, so that if felled at this size a greater part of it could be utilized as fuel. It would also fix the age most favourable for the natural regeneration of the species, as a crop of well established seedlings only now appear. Regeneration is hardly noticeable in a thicket, owing to the dense shade and sterile seeds produced. Bakau comes into importance as a regenerator at 4 inches diameter and if removed soon after, the forests would not only be thrown back in strength for a period of 5 to 8 years, but would also result in clean fellings and deteriorate in density and composition especially in the case of a mixed crop.

Bakau under 6 inches diameter is used for fishing stakes only and not appreciable as fuel, it is only matured Bakau that can be used immediately after conversion as the woody cells are saturated with resinous products. The specific gravity is heavier than sea water. Wood smaller than 6 inches diameter is a bit sappy and the fibres not being properly differentiated nor the xylem bundles completely liquified, fires do not travel quite so fast along the tissues resulting in a smoky fuel, splits take fire more readily as they dry quicker.

Bakau depreciates in value after 18 inches diameter. It grows principally on silt where the long heavy seeds on being drifted or falling are easily embedded in the soil.

With a 6-inch diameter, I have no doubt but that the Forest Capital would be increased and worked under short rotations, ensuring the quickest and highest net returns.

V. P. BORGES.

HOLLINGBURY ESTATE,
MUAR *viâ* SINGAPORE,
STRAITS SETTLEMENTS.
November 12th, 1904.

BEETLES ATTACKING RUBBER.

The Editor,
STRAITS BULLETIN.

Dear Sir,—I am sending herewith three specimens of a beetle I have often noticed feeding on the young shoots and leaves of Para plants, and would be obliged if you would let me know, in your next issue if it is a common species. These specimens were taken from a field adjoining jungle, planted with Para stumps and the beetles had attacked the first shoots. They do not appear to be numerous, or to do any serious damage. The specimens sent, I killed with tobacco smoke while on the leaves, and am sending them with the leaves on which they were feeding. I have also enclosed a leaf to the under side of which the eggs of some insects are attacked.

I have, &c.,

R. A. BURGESS.

The beetles sent by Mr. BURGESS are tiger beetles *Cicindela*, sp. They are little over ¼ inch long, brown in colour above with large black eyes and powerful toothed jaws, the thorax narrow and cylindric, the elytra deep green or brown with a yellow edge and a few yellow waved markings and dots. They are finely punctate all over the punctations having a red and green metallic lustre; the underside of the body is covered with white hairs, and with the long legs and the thoracic and neck joints is metallic green. Three of the beetles were holding firmly on to the shoots and leaf out of which a portion had certainly been bitten by something and the mouths of the insects seemed to be covered with latex. All these beetles are, however, carnivorous, living on other insects and their jaws are not at all adapted for vegetable food. What can have induced them to bite the rubber plants is hard to say. This class of beetles is one to be encouraged as they destroy a number of other insects, both in their larval form and as adults. It may be taken as an accident that these beetles have bitten the plant and that they will probably do no real harm. The eggs referred to were very curious. They had the shape of a cylindrical bottle containing a dull

red liquid tipped with a white porcelain neck and stopper. They were erect on the leaf 19 in a cluster. They hatched out into yellow bugs too young to identify. They might be either carnivorous or plant sucking bugs.

In a later letter, Mr. BURGESS states that more beetles have attacked the young plants, and that when they bite the shoots they are caught by the outflowing latex and soon perish. He suggests that this action of the latex shows at least one use of it to the plant inasmuch as it destroys any would be depredators, and so protects the seedlings.—*Editor*.

RAMIE.

TO THE EDITOR OF THE AGRICULTURAL BULLETIN.

SIR,—Through the courtesy of a friend, who has been many years in the Straits Settlements, who is at present on a visit here, I was favoured with a perusal of your interesting Journal in which I see a correspondence between Mr. BAXENDALE and Mr. RADCLYFFE on Ramie growing and treatment. The one professes to grow it successfully and the other professes to be able to treat it. Here then is a combination that ought to solve the Ramie problem which is not the simple affair that Mr. RADCLYFFE thinks in so far as the supply of cheap labour is concerned as what can be done in China by hand could not be accomplished in any other country where the plant could be grown. From all that I have seen, read and been able to do with Ramie I have arrived at the conclusion that the fibre has been kept in the back ground by the ignorant interference of people who have had no training in the working of any known textile. Owing to this they have employed expensive methods and machines where none have been needed in the preparation of the fibre, which has been so prepared that this had to be followed up by machinery specially designed to prepare and spin the fibre into yarns.

These conditions create a deadlock to the expansion of Ramie culture as the grower requires to be assured of a market and a good one at that for his produce, while the manufacturer will not incur the enormous expense of specially designed machinery unless he is certain that abundant and ample supplies can be had. My own idea to get over this difficulty is to prepare the fibre to suit existing conditions so that ordinary flax and tow machinery could work it up without the slightest alteration. That this can be done and has been done I have proved by results admitted to be very satisfactory. This then gives Ramie a footing in the textile industries, as it will not matter whether the manufacturer gets a ton to buy or a thousand. He is at no expense or disadvantage in using the fibre so prepared.

In doing this there is no question as to the relative cost of Ramie precluding it from successfully competing with even the finest of flax as good brown ribbon such as Mr. BAXENDALE grows

some of which I have had will, at £18 a ton after wastage and cleaning charges are met, come in at less than good fair flax yarn. From samples of Ramie ribbon grown in the Straits Settlements where I understand it can be cut about 6 times a year I should think that £18 a ton for it as taken off the stem ought to pay the grower especially if little hand labour is employed in removing the peel or ribbon from off the stem. In all Ramie that I have seen and handled this could be vastly improved. The luxuriant specimens that I have had from the Straits, show that the country is an ideal spot for Ramie culture. The only drawback is the moist climate a matter that is easily overcome in this country where most of the yarns have to be dried artifically and Ramie fibre could be tackled there in similar lines and be sent in to the manufactures ready for use. The idea of a trade of any dimensions ever springing up in raw-ribbon may be abandoned as these lose in removing the bark and gum 40% and in baling must occupy two-thirds more space than the clean article would do. I have seen it stated that manufacturers prefer to get their ribbon without being prepared in any way. That may be for small pottering concerns making special articles at enormous prices. For even such it would be better and cheaper to get Ramie with the bark and gum removed and the fibre in a condition that they could give it any extra finish that was needed if Mr. BAXENDALE has not already done so. It would interest your readers to learn I have no doubt the height of fibre that a fair specimen plant will annually yield in the form of raw-ribbon as I estimate that at one pound per plant he will have 180 tons worth at £18 a ton £3,240. All that is needed to make Ramie the huge success that it will and deserves to be, is the knowledge amongst growers of how to remove the ribbon from the stem in quantity without hand labour, after this is done to be able to get rid of the outer brown bark and gum cheaply and effectively. The grower has to get all this information for nothing as by paying for it he would be only putting his hand in his pocket for the benefit of others; although in a very short time he could do all that I say. Those who could make this plain to him will not do so as few care to give away for nothing knowledge gained by expense as well as time and trouble so that I think this the Radclyffe banner with its gay motto of Floreat Ramie will have to hang limp round its pole until some philanthropic soul pulls into practice without money and without price fee or reward the things that he professes to do and cannot. Excuse my going into this matter at such length. The question of Ramie-treatment has been magnified by inventors and patentees who have even the best of them been a hindrance instead of a help to a fibre which on economic grounds could when intelligently handled from stem to finish excel all others except jute in cheapness and returns.

I am yours, &c.,

JAMES ANDERSON,

6, Hillend Road,

Arbroath, N. B.

RAMIE TRADE OF THE WORLD.

The chief centres of production and consumption of ramie fibre are treated of in *Commercial Intelligence*, the following details being furnished concerning a plant with whose future trade values the countries of Central and South America are largely concerned.

In Europe, the principal ramie-consuming countries are France and Germany. The importations into the latter country, in 1900, amounted to 660 metric tons, valued at 422,000 marks; while in 1901, the import value rose to 605,300 marks. All the fibre is of Chinese origin and re-exportation is insignificant as it is employed in domestic manufactures. The largest ramie mill in Germany is at Emmendingen, in Baden, employing about 8,000 spindles and paying a dividend for the last seven years of from 5 to 7 per cent.

In France there are four mills, with 15,000 spindles. The following figures show the quantities and valuations of ramie imports for home consumption used in French factories from 1898 to 1900, inclusive:—

Year.	Quantity Metric tons.	Value.
1898	466	303,000
1899	298	179,000
1900	774	404,000

There are perhaps 3,000 spindles engaged on ramie in Switzerland. In England, the principal ramie mills are the Bunbeg Mills, in London. The consumption in North America is difficult to estimate, as the customs statistics do not mention ramie. The imports of fibres not specified in United States statistics amounted, in 1900, to 5,121 metric tons, value at 306,000 dollars, and in 1901 to 3,860 metric tons, with a valuation of 218,000 dollars.

The country which exports the large quantities of ramie is China. The chief centres of production are in the south-western section of the Province of Hupe, near Futchan and Mahsai and at Hunan, the chief export centres being Shanghai and Hankow, though a small amount is also shipped *viá* Swatow and Tientsin. The customs registers confound it with other fibres under the heading "hemp." It is stated that about one-half of this so called hemp is supposed to be, in reality, ramie fibre. Following are some Chinese statistic for hemp exports during the years named:—

Years.	Piculs.	Value.
1890	35,596	162,419
1895	97,926	552,639
1896	86,913	643,000
1897	99,474	783,965
1898	106,845	782,032
1899	166,205	1,323,388
1900	178,445	1,073,154
1901	174,641	1,337,521

Most of the exports are to Japan, France and Antwerp, German spinners obtaining their supplies from the last mentioned city. A limited amount of ramie textile is produced in Japan and Korea. The island of Formosa, in 1898, exported 28,685 picu's of various fibres to China, the main part of which was ramie. Although the United States, Guatemala, Colombia and Brazil are to a greater or less extent producers of this fibre, its culture has not yet reached the proportions anticipated, while in Mexico, however, it seems to have good prospects and an excellent quality has been obtained. Its value is universally recognized, and used in conjunction with other textile materials it adds greatly to their durability and beauty.

(Indian Planting and Gardening Vol. XIV p. 752.)

MISCELLANEOUS.

NOTICES TO SUBSCRIBERS.

1. For the information of subscribers and others who wish to complete their series of Bulletins, notice is given that numbers 1, 7, 8 and 9. of the old Series (1891 to 1900) and Nos. 8, 9 and 10, of New Series, Vol. I (1901-1902) have been reprinted and copies can be had by all whose subscriptions are paid up to date. The cost to others is 50 cents a number.

2. A very large number of subscriptions, even for last year, are yet unpaid although subscribers have received more than one notice of the delay in payment. As this entails a good deal of extra work on the staff, subscribers are asked to send in their subscriptions without delay. Attention is called to the rule that all subscriptions should be prepaid.

3. Subscribers changing their addresses are requested to give notice to the Editor.

4. Subscribers outside the Peninsula will in future be charged $3.50 per annum instead of $3 to cover postage.

Meteorological observers are asked to send in their returns to arrive before the 10th day of the following month, if possible, so as to be in time for going to press.

Rainfall for October, 1904 :—

The Prison	...	Ins. 21·30
The Fort	...	,, 20·75
Government Hill	...	,, 24·80
Balik Pulau	...	,, 17·73
Pulau Jerejak	...	,, 17·62
Lumut ...	...	,, 19·20
Pangkore ...	...	,, 21·39
Bruas ...	...	,, 15·48

M. E. SCRIVEN,

Assistant Surgeon,

Penang, 14th November, 1904. *Prison Observatory.*

SINGAPORE MARKET REPORT.

September, 1904.

Articles.	Quantity sold.	Highest price.	Lowest price.
	Tons.	$	$
Coffee—Palembang	...	26.50	26.00
Bali	35	25.00	23.50
Liberian	148	24.50	22.50
Copra	3,585	9.10	8.00
Gambier	2,083	9.50	8.62½
Cube Gambier, Nos. 1 & 2.	160	15.00	13.00
Gutta Percha, 1st quality	...	200.00	150.00
Medium	...	100.00	90.00
Lower	...	80.00	19.00
Borneo Rubber 1, 2, and 3	...	145.00	85.00
Gutta Jelutong	...	9.50	9.00
Nutmegs, No. 110's	...	50.00	47.00
No. 80's	...	80.00	78.00
Mace, Banda	...	115.00	95.00
Amboyna	...	80.00	75.00
Pepper, Black	535	31.00	28.00
White (Sarawak)	296	43.25	37.50
Pearl Sago, Small	75	4.20	3.80
Medium	...	...	...
Large	...	...	...
Sago Flour, No. 1	2,286	3.75	3.40
No. 2	213	1.20	1.10
Flake Tapioca, Small	451	4.35	4.15
Medium	10	4.30	
Pearl Tapioca, Small	401	4.35	4.20
Medium	449	4.35	4.20
Bullet	5	5.10	5.00
Tin	1,965	78.75	75.50

SINGAPORE MARKET REPORT.

October, 1904.

Articles.	Quantity sold.	Highest price.	Lowest price.
	Tons.	$	$
Coffee—Palembang	...	32.50	26.00
Bali	...	25.50	24.50
Liberian	119	26.00	24.00
Copra	4,778	8.90	8.00
Gambier	3,220	9.80	9.00
Cube Gambier, Nos. 1 and 2	348	14.50	13.00
Gutta Percha, 1st quality	...	200.00	150.00
Medium	...	100.00	90.00
Lower	...	80.00	19.00
Borneo Rubber 1, 2, and 3	...	145.00	85.00
Gutta Jelutong	...	9.50	8.40
Nutmegs, No. 110's	...	48.00	42.00
No. 80's	...	78.00	65.00
Mace, Banda	...	95.00	90.00
Amboyna	...	74.00	64.00
Pepper, Black	747	31.00	28.75
White (Sarawak)	810	43.25	39.00
Pearl Sago, Small	50	4.20	4.00
Medium	...	...	...
Large	...	...	
Sago Flour, No. 1	4,060	3.90	3.55
No. 2	865	1.25	1.05
Flake Tapioca, Small	368	4.60	4.35
Medium	25	...	...
Pearl Tapioca, Small	425	4.60	4.40
Medium	511	4.60	4.40
Bullet	105	5.50	5.00
Tin	2,975	79.50	77.50

Closing fair.

Export Telegram to Europe and America.

For Fortnight ending 15th September, 1904.

Wired at 2.15 p. m. on 16th September, 1904.

					Tons.
10	Tin	Str.	Singapore & Penang	United Kingdom &/or	1,511
11	Do.	,,	Do.	U. S. A.	250
12	Do.	,,	Do.	Continent	467
13	Gambier	,,	Singapore	London	...
14	Do.	,,	Do.	Liverpool	50
15	Do.	,,	Do.	U. K. &/or Continent	490
16	Cube Gambier	,,	Do.	United Kingdom	10
17	Black Pepper	,,	Do.	Do.	30
18	Do.	,,	Penang	Do.	...
19	White Pepper	,,	Singapore	Do.	120
20	Do.	,,	Penang	Do.	...
21	Pearl Sago	,,	Singapore	Do.	80
22	Sago flour	,,	Do.	London	170
23	Do.	,,	Do.	Liverpool	1,900
24	Tapioca, Flake	,,	Singapore & Penang	United Kingdom	380
25	Do. Pearl	,,	Do.	Do.	380
26	Do. Flour	,,	Penang	Do.	480
27	Gutta Percha	,,	Singapore	Do.	...
28	Copra	,,	Singapore & Penang	Do.	...
29	Buffalo Hides	,,	Singapore	Do.	110
30	Pineapples	,,	Do.	Do.	cases 3,500
31	Gambier	,,	Do.	U. S. A.	390
32	Cube Gambier	,,	Do.	Do.	20
33	Black Pepper	,,	Do.	Do.	150
34	White Pepper	,,	Do.	Do	20
35	Black Pepper	,,	Penang	Do.	...
36	White Pepper	,,	Do.	Do.	...
37	Nutmegs	,,	Singapore & Penang	Do.	5
38	Flake & Pearl	,,	Do.	Do.	210
39	Pineapples	,,	Singapore	Do.	cases 7,250
40	Do.	,,	Do.	Continent	1,000
41	Gambier	,,	Do.	S. Continent	270
42	Do.	,,	Do.	N. Continent	130
43	Cube Gambier	,,	Do	Continent	70
44	Tapioca Flake	,,	Singapore & Penang	Do.	220
45	Do. Pearl	,,	Do.	Do.	370
46	Copra	,,	Do.	Marseilles	660
47	Do.	,,	Do.	Odessa	...
48	Do.	,,	Do.	S. Continent	740
49	Do.	,,	Do.	N. Continent	1,600
50	Black Pepper	,,	Singapore	S. Continent	270
51	Do.	,,	Do.	N. Continent	50
52	White Pepper	,,	Do.	S. Continent	20
53	Do.	,,	Do.	N. Continent	130
54	Do.	,,	Penang	S. Continent	20
55	Do.	,,	Do.	N. Continent	40
56	Black Pepper	,,	Do.	S. Continent	70
57	Do.	,,	Do.	N. Continent	10
58	Sago Flour	,,	Singapore	U. S. A.	20
59	Do.	,,	Do.	Continent	1,500
60	Do.	,,	Do.	Glasgow	...
61	Gambier	,,	Do.	Do.	...
62	Do.	,,	Do.	U. S. A.	...

					Tons.
63	Flake and Pearl	Str.	Singapore	U. S. A.	
64	Cube Gambier	..	Do.	Do	...
65	White Pepper	..	Do.	Do.	...
66	Do.	..	Penang	Do.	...
67	Pineapples	.	Singapore	Do.	...
68	Gambier	..	Do.	S. Continent	...
69	Copra	.	Do.	Marseilles	...
70	Black Pepper		Do.	S. Continent	
71	White Pepper	..	Do.	Do.	...
72	Black Pepper	..	Do.	U. S. A.	...
73	Do.	..	Penang	Do.	...

950 tons Gambier }
360 ,, Black Pepper } Contracts

Export Telegram to Europe and America.

For Fortnight ending 30th September, 1904.

Wired at 3.30 p. m. on 1st October, 1904.

10	Tin	Str.	Singapore & Penang	United Kingdom &/or	1,376
11	Do.	..	Do.	U. S. A.	370
12	Do.	..	Do.	Continent	345
13	Gambier	..	Singapore	London	...
14	Do.	..	Do.	Liverpool	...
15	Do.	..	Do.	U. K. &/or Continent	90
16	Cube Gambier	..	Do.	United Kingdom	...
17	Black Pepper	..	Do.	Do.	30
18	Do.	..	Penang	Do.	20
19	White Pepper	..	Singapore	Do.	30
20	Do.	..	Penang	Do.	10
21	Pearl Sago	..	Singapore	Do.	20
22	Sago Flour	..	Do.	London	...
23	Do.	..	Do.	Liverpool	...
24	Tapioca Flake	..	Singapore & Penang	United Kingdom	10
25	Do. Pearl	..	Do.	Do.	130
26	Do. Flour	..	Penang	Do.	250
27	Gutta Percha	..	Singapore	Do.	20
28	Copra	..	Singapore & Penang	Do.	...
29	Buffalo Hides	..	Singapore	Do.	80
30	Pineapples	..	Do.	Do.	...
31	Gambier	..	Do.	U. S. A.	250
32	Cube Gambier	.	Do.	Do.	20
33	Black Pepper	..	Do.	Do	310
34	White Pepper	..	Do.	Do.	130
35	Black Pepper	.	Penang	Do.	250
36	White Pepper	..	Do.	Do.	40
37	Nutmegs	..	Singapore & Penang	Do.	58
38	Flake and Pearl	..	Do.	Do.	480
39	Pineapples	.	Singapore	Do.	cases 4,500
40	Do.	..	Do.	Continent	cases 250
41	Gambier	..	Do.	S. Continent	...
42	Do.	.	Do.	N. Continent	150
43	Cube Gambier	..	Do.	Continent	10
44	Tapioca Flake	..	Singapore & Penang	Do.	230
45	Do. Pearl	..	Do.	Do.	250
46	Copra	.	Do.	Marseilles	150
47	Do.		Do.	Odessa	...

					Tons.
48	Copra	Str.	Singapore & Penang	S. Continent	...
49	Do.	,,	Do.	N. Continent	900
50	Black Pepper	,,	Singapore	S. Continent	40
51	Do.	,,	Do.	N. Continent	10
52	White Pepper	,,	Do.	S. Continent	...
53	Do.	,,	Do.	N. Continent	80
54	Do.	,,	Penang	S. Continent	20
55	Do.	,,	Do.	N. Continent	40
56	Black Pepper	,,	Do.	S. Continent	30
57	Do.	,,	Do.	N. Continent	...
58	Sago Flour	,,	Singapore	U. S. A.	...
59	Do.	,,	Do.	Continent	...
60	Do.	,,	Do.	Glasgow	..
61	Gambier	,,	Do.	Do.	...
62	Do.	,,	Do.	U. S. A.	...
63	Flake and Pearl	..	Do.	Do.	...
64	Cube Gambier	..	Do.	Do.	..
65	White Pepper	,,	Do.	Do.	...
66	Do.	,,	Penang	Do.	...
67	Pineapples	,,	Singapore	Do.	...
68	Gambier	,,	Do.	S. Continent	...
69	Copra	..	Do.	Marseilles	...
70	Black Pepper	,,	Do.	S. Continent	...
71	White Pepper	,,	Do.	Do.	...
72	Black Pepper	,,	Do.	U. S. A.	...
73	Do.	,,	Penang	Do.	...

1,250 tons Gambier }
200 ,, Black Pepper } Contracts.

Export Telegram to Europe and America.

For Fortnight ending 15th October, 1904.

Wired at 4.50 p.m. on 17th October, 1904

10	Tin	Str.	Singapore & Penang	United Kingdom &/or	1,575
11	Do	,,	Do.	U. S. A.	100
12	Do.	,,	Do.	Continent	535
13	Gambier	,,	Singapore	London	...
14	Do.	,,	Do.	Liverpool	180
15	Do.	,,	Do.	U. K. &/or Continent	470
16	Cube Gambier	,,	Do.	United Kingdom	30
17	Black Pepper	,,	Do.	Do.	20
18	Do.	,,	Penang	Do.	...
19	White Pepper	,,	Singapore	Do.	80
20	Do.	,,	Penang	Do.	...
21	Pearl Sago	,,	Singapore	Do.	100
22	Sago flour	,,	Do.	London	330
23	Do.	,,	Do.	Liverpool	1,200
24	Tapioca Flake	,,	Singapore & Penang	United Kingdom	510
25	Do. Pearl	,,	Do.	Do.	210
26	Do. Flour	,,	Penang	Do.	340
27	Gutta Percha	,,	Singapore	Do.	10
28	Copra	..	Singapore & Penang	Do.	...
29	Buffalo Hides	..	Singapore	Do.	150
30	Pineapples	..	Do.	Do.	cases 500
31	Gambier	.	Do.	U. S. A.	...
32	Cuba Gambier	..	Do.	Do.	...
33	Black Pepper	.	Do.	Do.	30

					Tons.
34	White Pepper	Str.	Singapore	U.S.A.	20
35	Black Pepper	,,	Penang	Do.	...
36	White Pepper	,,	Do.	Do.	...
37	Nutmegs	,,	Singapore & Penang	Do.	7
38	Flake & Pearl	,,	Do.	Do.	40
39	Pineapples	,,	Singapore	Do.	cases 500
40	Do.	,,	Do.	Continent	1,500
41	Gambier	,,	Do.	S. Continent	440
42	Do.	,,	Do.	N. Continent	100
43	Cube Gambier	,,	Do.	Continent	70
44	Tapioca Flake	,,	Singapore & Penang	Do.	160
45	Do. Pearl	,,	Do.	Do.	220
46	Copra	,,	Do.	Marseilles	2,000
47	Do.	,,	Do.	Odessa	...
48	Do.	,,	Do.	S. Continent	280
49	Do.	,,	Do.	N. Continent	1,350
40	Black Pepper	,,	Singapore	S. Continent	120
51	Do	,,	Do.	N. Continent	30
52	White Pepper	,,	Do	S. Continent	40
53	Do.	,,	Do.	N. Continent	160
54	Do.	,,	Penang	S. Continent	10
55	Do.	,,	Do.	N. Continent	10
56	Black Pepper	,,	Do.	S. Continent	60
57	Do.	,,	Do.	N. Continent	...
58	Sago Flour	,,	Singapore	U. S. A.	...
59	Do.	,,	Do.	Continent	1,100
60	Do.	,,	Do.	Glasgow	20
61	Gambier	,,	Do.	Glasgow	50
62	Gambier	Slr.	Do.	U. S. A.	...
63	Flake & Pearl	,,	Do.	Do.	...
64	Cube Gambier	,,	Do.	Do.	...
65	White Pepper	,,	Do.	Do.	...
66	Do.	,,	Penang	Do.	...
67	Pineapples	,,	Singapore	Do.	...
68	Gambier	,,	Do.	S. Continent	...
69	Copra	,,	Do.	Marseilles	...
70	Black Pepper	,,	Do.	S. Continent	...
71	White Pepper	,,	Do.	S. Continent	...
72	Black Pepper	,,	Do.	U. S. A.	...
73	Do.	,,	Penang	Do.	...

1,450 tons Gambier } Contracts.
290 ,, Balck Pepper }

Export Telegram to Europe and America.

For Fortnight ending 31st October, 1904.

Wired at 3.50 p.m. on 1st November, 1904.

10	Tin	Str.	Singapore and Penang	United Kingdom &/or	2,126
11	Do.	,,	Do.	U. S. A.	250
12	Do.	,,	Do.	Continent	407
13	Gambier	,,	Singapore	London	20
14	Do.	,,	Do.	Liverpool	...
15	Do.	,,	Do.	U. K. &/or Continent	50
16	Cube Gambier	,,	Do.	United Kingdom	10
17	Black Pepper	,,	Do.	Do.	...
18	Do.	,,	Penang	Do.	20
19	White Pepper	,,	Singapore.	Do.	130

					Tons.
20	White Pepper	Str.	Penang	United Kingdom	30
21	Pearl Sago	,,	Singapore	Do.	10
22	Sago flour	,,	Do.	London	300
23	Do.	,,	Do.	Liverpool	...
24	Tapioca Flake	,,	Singapore & Penang	United Kingdom	150
25	Do. Pearl	,,	Do.	Do.	110
26	Do. Flour	,,	Penang	Do.	270
27	Gutta Percha	,,	Singapore	Do.	10
28	Copra	,,	Singapore & Penang	Do.	...
29	Buffalo Hides	,,	Singapore	Do.	10
30	Pineapples	,,	Do.	Do.	...
31	Gambier	,,	Singapore	U. S. A.	1,150
32	Cube Gambier	,,	Do.	Do.	30
33	Black Pepper	,,	Do.	Do.	150
34	White Pepper	,,	Do.	Do.	60
35	Black Pepper	,,	Penang	Do.	270
36	White Pepper	,,	Do.	Do.	50
37	Nutmegs	,,	Singapore & Penang	Do.	46
38	Flake and Pearl	,,	Do.	Do.	180
39	Pineapples	,,	Singapore	Do.	...
40	Do.	,,	Do.	Continent	500
41	Gambier	,,	Do.	S. Continent	50
42	Do.	,,	Do.	N. Continent	60
43	Cube Gambier	,,	Do.	Continent	50
44	Tapioca Flake	,,	Singapore & Peneng	Do.	120
45	Do. Pearl	,,	Do.	Do.	60
46	Copra	,,	Do.	Marseilles	800
47	Do.	,,	Do.	Odessa	...
48	Do.	,,	Do.	S. Continent	...
49	Do.	,,	Do.	N. Continent	1,100
50	Black Pepper	,,	Singapore	S. Continent	20
51	Do.	,,	Do.	N. Continent	60
52	White Pepper	,,	Do.	S. Continent	50
53	Do.	,,	Do.	N. Continent	210
54	Do.	,,	Penang	S. Continent	10
55	Do.	,,	Do.	N. Continent	30
56	Black Pepper	,,	Do.	S. Continent	20
57	Do.	,,	Do.	N. Continent	...
58	Sago Flour	,,	Singapore	U. S. A.	...
59	Do.	,,	Do.	Continent	120
60	Do.	,,	Do.	Glasgow	...
61	Gambier	,,	Do.	Glasgow	...
62	Gambier	,,	Do.	U. S. A.	...
63	Flake and Pearl	,,	Do.	Do.	...
64	Cube Gambier	,,	Do.	Do.	...
65	White Pepper	,,	Singapore	Do.	...
66	White Pepper	,,	Penang	Do.	...
67	Pineapples	,,	Singapore	Do.	...
68	Gambier	,,	Do.	S. Continent	...
69	Copra	,,	Do.	Marseilles	...
70	Black Pepper	,,	Do.	S. Continent	...
71	White Pepper	,,	Do.	S. Continent	...
72	Black Pepper	,,	Do.	U. S. A.	...
73	Do.	,,	Penang	U. S. A.	...

1,600 tons Gambier } Contracts.
350 ,, Black Pepper }

Singapore.

Abstract of Meteorological Readings for the month of October, 1904.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension	Dew Point.	Humidity.			
	Ins.	°F.	°F.	°F.	°F.	°F.	°F.	Ins.	°F	%		Ins.	Ins.
Kandang Kerbau Hospital Observatory	29·871	142·7	79·9	87·7	73·5	14·2	77·1	·808	75·1	79	S.S.W. & N.W.	8·29	2·04

A. B. LEICESTER,
Meteorological Observer.

D. K. McDOWELL,
Principal Civil Medical Officer, S.S.

Kandang Kerbau Hospital Observatory,
Singapore, 17th November, 1904.

Penang.

Abstract of Meteorological Readings in the Prison Observatory for the month of October, 1964.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
	Ins.	°F	°F	°F	°F	°F	°F	°F	%	%		Ins.	Ins.
Criminal Prison Observatory	29·882	139·6	79·5	89·0	73·8	15·2	75·0	·784	70·68	73	S.	21·30	3·48

Colonial Surgeon's Office,
Penang, 14th November, 1904.

M. E. SCRIVEN,
Assistant Surgeon.

T. C. MUGLISTON,
Colonial Surgeon, Penang.

Malacca.

Abstract of Meteorological Readings for the month of October, 1904.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
	Ins.	°F	°F	°F	°F	°F	°F	°F	%	%		Ins.	Ins.
Durian Daun Hospital ...	29·842	162·6	79·0	89·2	70·3	19·4	77·8	1·019	72·4	95	N.W.	22·43	3·42

F. B. CROUCHER,

Colonial Surgeon, Malacca.

Colonial Surgeon's Office,

Malacca, 18th November, 1904.

Perak.

Abstract of Meteorological Readings in the various Districts of the State for the month of October, 1904.

District.	Maximum in Sun.	Temperature.				Hygrometer.			Total Rainfall	Greatest rainfall during 24 hours.
		Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Humidity.		
Taiping ...	153	80·60	91	71	18	76·59	863	83	11·34	1·54
Kuala Kangsar ...	...	79·50	92	72	19	75·56	831	82	9·25	1·86
Batu Gajah ...	167	80·05	92	71	20	75·54	824	80	12·26	2·41
Gopeng ...	...	80·36	91	63	27	75·84	833	80	18·18	2·41
Ipoh ...	...	80·34	92	69	19	76·13	845	81	7·88	0·93
Kampar ...	...	...	92	69	22	...	...	...	14·35	1·75
Teluk Anson ...	...	80·63	90	71	18	76·84	873	84	10·21	1·66
Tapah ...	..	79·68	91	69	21	75·86	842	83	17·83	1·98
Parit Buntar ...	...	80·04	89	71	16	76·65	872	86	14·25	2·40
Bagan Serai ...	...	81·23	90	72	15	76·20	837	78	16·15	4·35
Selama ...	...	80·31	88	72	15	76·96	885	86	20·72	2·70

State Surgeon's Office,

Taiping, 14th November, 1904.

M. J. WRIGHT,

State Surgeon, Perak.

Selangor.

Abstract of Meteorological Readings in the various Districts of the State for the month of October, 1904.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature. Mean Dry Bulb.	Temperature. Maximum.	Temperature. Minimum.	Temperature. Range.	Hygrometer. Mean Wet Bulb.	Hygrometer. Vapour Tension	Hygrometer. Dew Point	Hygrometer. Humidity.	Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
General Hospital, Kuala Lumpur	29·882	140·1	79·4	89·0	71·7	17·3	75·6	0·815	73·1	80	S.W.	15·73	3·08
Pudoh Gaol Hospital ,, ...	...	...	...	...	...	...	...	...	...	...	...	18·60	2·00
District Hospital ,, ...	...	...	...	...	...	...	...	...	...	...	...	13·39	2·87
,, Klang	...	...	...	86·5	72·3	14·2	...	...	...	...	...	9·71	1·23
,, Kuala Langat	...	...	...	85·2	71·0	14·2	...	...	...	...	...	15·38	3·46
,, Kajang	...	...	...	91·5	73·2	18·3	...	...	...	...	...	10·66	2·14
,, Kuala Selangor	...	...	...	86·0	75·1	10·9	...	...	...	...	...	9·64	1·66
,, Kuala Kubu	...	...	...	90·1	72·2	17·9	...	...	...	...	...	17·09	2·25
,, Serendah	...	...	...	89·7	75·0	14·7	...	...	...	...	...	9·99	2·36
,, Rawang	...	...	...	84·7	70·6	14·1	...	...	...	...	...	12·07	2·29
Beri-beri Hospital, Jeram	...	...	...	...	...	...	...	...	...	...	...	12·75	2·67
Sabah Bernam	...	...	...	...	...	...	...	...	...	...	...	13·99	3·20

State Surgeon's Office,
Kuala Lumpur, 16th November, 1904.

A. J. McCLOSKY,
Acting State Surgeon, Selangor.

Pahang.

Abstract of Meteorological Readings in the various Districts of the State for the months of September, 1904.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
Kuala Lipis ...	...	...	...	95·0	68·0	19·67	...	...	...	...	...	6·82	1·61
Raub ...	...	...	...	92·0	67·0	18·90	...	...	...	...	...	4·70	1·20
Bentong ...	...	...	...	94·0	68·0	16·10	...	...	...	...	...	6·73	3·2[illegible]
Pekan ...	...	...	...	96·5	71·0	17·05	...	...	...	...	...	5·76	0·84
Sungei Lembing Kuantan ...	...	...	...	89·5	67·0	22·5	...	...	...	...	...	8·79	1·65
Temerloh ...	...	...	...	94·0	70·0	24·00	...	...	...	...	...	6.87	1·24
						For October.							
Kuantan ...	...	...	...	84·0	74·0	10·00	...	...	...	...	...	8·25	2.00

KUANTAN,

28th October, 1904.

S. LUCY,

State Surgeon, Pahang.

Meteorological Observations taken at Kuala Kuantan, Pahang, during the month of October, 1904.

Date.	Temperature of Air.			Rainfall.			Remarks.
	Maximum.	Minimum.	Range.	6 A.M.	6 P.M.	Total.	
1				...	...	...	
2				...	...	...	
3				...	...	...	
4				...	·20	·20	
5				..	·10	·10	
6				..	..	...	
7				...	...	...	
8				...	...	...	
9				·60	·20	·80	
10				·70	...	·70	
11				...	...	...	
12				·30	...	·30	
13				...	...	...	
14				...	...	...	
15				·40	...	·40	
16				...	·10	·10	
17				·20	...	·20	
18				...	1·20	1·20	
19				...	·70	·70	
20				...	...	...	
21				...	...	...	
22				...	...	...	
23				...	...	...	
24				...	·30	·30	
25				...	·10	·10	
26				·15	...	·15	
27				1·30	·70	2·00	
28				·20	...	·20	
29				·70	...	·70	
30				...	...	...	
31				·70	...	·70	
Total						8·85	
Means							

H. C. PAXON,
Observer.

Muar.

Abstract of Meteorological Readings in Muar for the month of October, 1904.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.					Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.		Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
Lanadron Estate ...	...	...	81°	86°	72°	14°		75°	...	...	...	...	7·62	1·72

Muar, 1st November, 1904.

ROGER PEARS.

The Duff Development Company Limited, Kelantan.

Abstract of Meteorological Readings for the month of October, 1904.

District.	Temperature.			Rainfall.	
	Mean Maximum.	Mean Minimum.	Mean Range.	Total Rainfall.	Greatest Rainfall during 24 hours.
	°F	°F	°F	Inches.	Inches.
Kuala Lebir ...	89·1	70·9	18·2	16·79	3·35
Manson's Camp, Ulu Liang ...	87·8	71·2	16·6	12·31	2·94
Bukit Segana, Ulu Liang ...	85·0	70·0	15·0	11·62	1·98
Kuala Kelantan ...	85·5	72·9	12·6	5·8	1·12

Kuala Lebir, 7th November, 1904.

JOHN D. GIMLETTE.

METEOROLOGICAL OBSERVATIONS.

Table Showing The Daily Results Of The Reading Of Meteorological Observations Taken At The General Hospital, Seremban, For The Month Of October, 1904.

Date.	Temperature of radiation.						Temperature of radiation.				Wind. Direction.		Temperature of evaporation.			Computed vapour tension.			Relative humidity.			Clouds 0 to 10.			Cloud and weather initials.			Rain.
	9 H	15 H	Mean.	Maximum.	Minimum.	Range.	Sun.	Difference sun and shade.	Grass.	Difference shade and radiation.	9 H	15 H	9 H	15 H	Mean.	9 H	15 H	Mean.	9 H	15 H	Mean.	9 H	15 H	21 H	9 H	15 H	21 H	Inches.
	°	°	°	°	°	°	°	°	°	°			°	°		in.	in.											
1	80	84	82	85	72	13	152	67	65	7	S.E.	S.E.	73.3	75.7	74.5	0.820	0.888	0.854	80	76	78	2	0	0	B	B	B	
2	79	84	81.5	87	71	16	165	78	64	7	S.E.	S.W.	72.3	75.7	74	.793	.888	.840	80	76	78	3	0	0	C	B	B	
3	78	78	78	85	72	13	151	66	65	7	S.E.	S.E.	72.9	72.9	72.9	.810	.810	.810	84	84	84	3	10	15	C	R	C	1.83
4	76	85	80.5	86	72	14	143	57	65	7	S.E.	S.E.	72.6	73.4	73	.801	.826	.813	89	68	78.5	5	0	0	C	B	B	.69
5	75	84	79.5	88	73	15	158	70	65	8	S.E.	S.E.	73.3	74	73.6	.820	.840	.830	94	72	83	10	0	0	R	B	B	.20
6	76	86	81	87	72	15	163	76	65	7	N.W.	S.W.	74.3	71.2	72.7	.848	.763	.805	94	61	77.5	5	0	2	C	B	B	.58
7	75	86	83.5	87	71	16	152	65	64	7	N.E.	E.	73.3	74	73.6	.820	.853	.837	94	68	81	10	0	2	R	B	B	.71
8	78	82	80	88	71	17	152	64	65	6	S.E.	S.E.	74.6	77	75.8	.857	.926	.891	89	85	87	3	3	5	C	C	C	.37
9	76	83	79.5	86	73	13	151	65	65	8	N.E.	N.	72.6	76.3	74.4	.801	.905	.853	89	80	84.5	5	3	0	C	C	C	
10	81	83	82	87	71	16	152	45	64	7	N.E.	N.E.	72.6	74.7	73.6	.802	.856	.829	76	76	76	0	2	2	B	B	B	
11	77	86	81.5	86	73	13	124	48	65	8	N.E.	S.E.	71.9	71.2	71.5	.783	.763	.773	84	61	72.5	2	0	2	B	B	B	
12	80	85	82.5	89	72	17	153	64	65	7	S.E.	N.E.	75	75	75	.867	.873	.870	85	72	78.5	0	0	2	B	B	B	
13	82	77	79.5	86	73	13	120	64	66	7	N.E.	S.E.	73.6	73.6	73.6	.830	.829	.829	76	89	72.5	0	10	2	B	R	B	.68
14	79	77	78	85	71	14	156	71	65	6	N.E.	N.E.	75.9	71.9	72.9	.839	.783	.811	85	84	84.5	2	10	2	B	R	B	
15	83	85	84	87	72	15	154	67	65	7	N.E.	N.E.	69.7	75	72.3	.724	.873	.798	64	72	68	0	0	2	B	B	B	
16	77	80	78.5	81	71	10	118	37	65	6	N.E.	N.E.	71.9	75	73.4	.783	.867	.825	84	85	84.5	2	3	2	B	C	B	
17	79	85	82	86	73	13	156	70	66	7	N.E.	S.E.	73.9	75	74.4	.839	.873	.856	85	72	78.5	2	0	5	B	B	C	.23
18	79	82	80.5	86	72	14	125	39	65	7	S.	S.	72.3	75.3	73.8	.773	.877	.835	80	80	80	2	2	5	B	B	C	.69
19	79	80	79.5	86	72	14	159	73	65	7	S.E.	S.E.	75.6	73.6	74.6	.888	.830	.859	90	76	83	2	8	5	B	O	C	
20	76	80	78	83	72	11	139	56	65	7	S.E.	S.E.	74.3	75	74.6	.848	.867	.857	94	85	89.5	3	3	3	C	C	C	.37
21	78	80	79	85	72	13	150	65	65	7	S.E.	S.	74.6	75	74.8	.857	.867	.862	89	85	87	3	10	5	C	R	C	1.95
22	76	80	79.5	85	69	16	155	70	65	4	S.E.	S.E.	72.3	76.3	74.3	.793	.867	.849	94	80	87	3	10	3	C	B	C	
23	73	81	82	88	72	16	145	57	65	7	N.E.	S.E.	74.7	76	75.3	.856	.905	.876	76	85	80.5	0	10	3	B	R	C	.23
24	76	81	78.5	82	70	12	117	35	64	6	N.E.	S.E.	71.3	76	73.6	.766	.897	.861	94	85	89.5	5	5	3	C	C	C	
25	78	81	79.5	86	71	15	160	74	65	6	E.	N.E.	74.6	74	74.3	.857	.897	.853	89	80	84.5	5	2	2	C	B	B	.93
26	79	85	82	86	71	15	135	49	65	6	S.E.	S.E.	73.9	75	74.4	.839	.873	.856	85	72	78.5	5	5	2	C	C	B	.46
27	78	85	81.5	86	71	15	136	50	65	6	S.E.	N.W.	74.6	75	74.8	.857	.873	.865	89	72	80.5	2	0	3	B	B	C	.21
28	77	86	81.5	88	72	16	159	71	65	7	W.	S.W.	73.6	76	74.8	.829	.904	.866	89	72	80.5	3	2	3	C	B	C	.28
29	80	84	82	85	72	13	128	43	65	7	S.W.	S.E.	75	72.4	73.7	.867	.794	.830	85	68	76.5	5	3	2	C	C	B	
30	80	87	83.5	87	72	15	154	67	65	7	S.E.	S.W.	75	73.9	74.4	.867	.837	.862	85	65	75	2	0	2	B	B	B	.63
31	79	86	82.5	87	72	15	146	59	66	7	N.E.	S.W.	73.9	69	71	.839	721	.780	85	58	71.5	0	0	2	B	B	B	

Total 11.04

STATE SURGEON'S OFFICE,
Seremban, 10th November, 1904.

J. SHEPLEY PART, M.D.,
Acting State Surgeon.

No. 11.] NOVEMBER, 1904. [VOL. III.

AGRICULTURAL BULLETIN

OF THE

STRAITS

AND

FEDERATED MALAY STATES.

EDITED BY

H. N. RIDLEY, M. A., F. L. S.,

Director of Botanic Gardens, S. S.

CONTENTS.

Annual Subscription—Three Dollars.
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SINGAPORE:

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NOTICE.

The Scientific and Technical Departments of the Imperial Institute.

His Excellency the Governor has received a despatch from the Right Hon'ble the Secretary of State for the Colonies calling attention to the advantages offered by the Imperial Institute to Merchants, Planters and others, who may wish to have samples submitted to scientific experts for opinion as to their commercial value, &c. The following extracts from a Memorandum published by the Authorities of the Imperial Institute will give an idea of the work undertaken and carried on there.

"The Scientific and Technical Department of the Institute has "been established to acquire information by special enquiries and "by experimental research, technical trials and commercial valua-"tion regarding new or little known natural or manufactured pro-"ducts of the various Colonies and Dependencies of the British "Empire and of Foreign Countries, and also regarding known "products procurable from new sources, and local products of "manufacture which it is desired to export. This work is carried "out with a view to the creation of new openings in trade, or the "promotion of industrial developments."

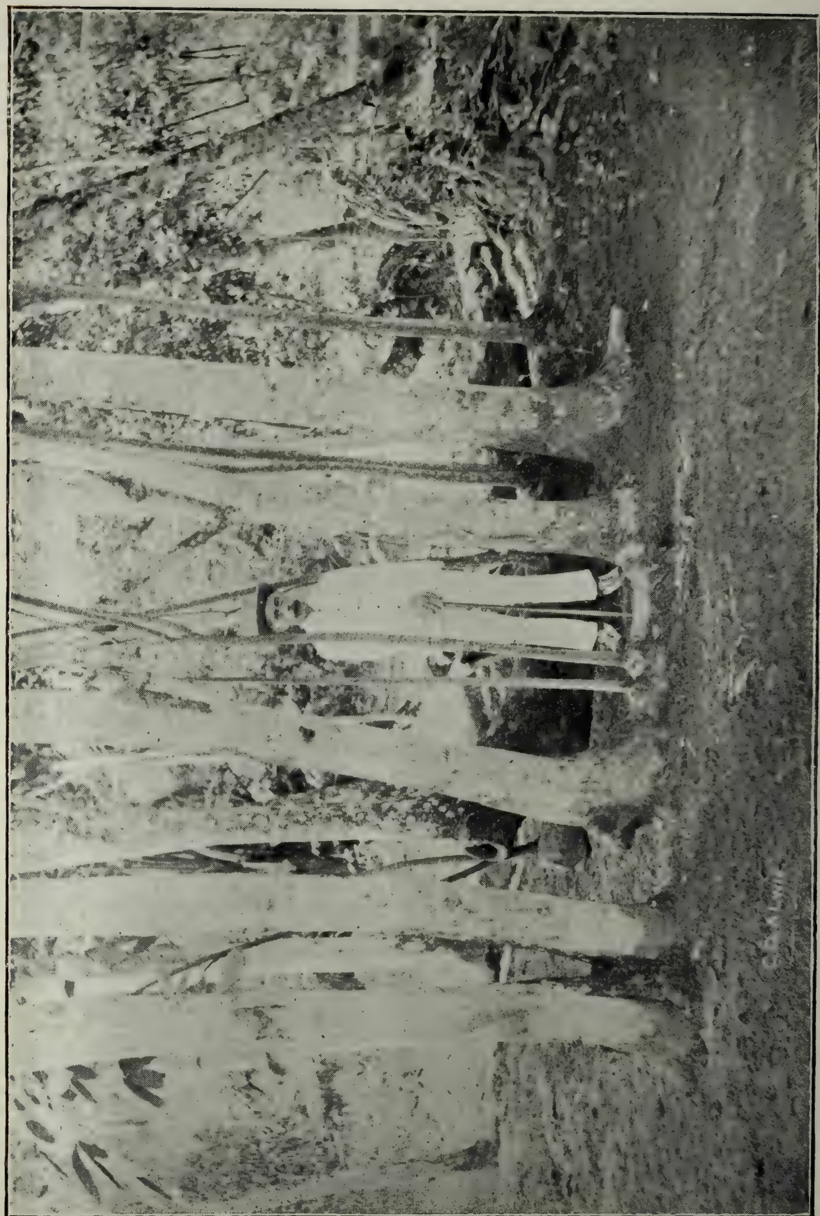
2. In an extensive and well equipped series of Research Laboratories, a numerous staff of skilled chemists under the direction of Professor Wyndham R. Dunstan, M.A., F.R.S., carry out the investigation of the chemical constitution and properties of new dye-stuffs, tanning materials, seeds and food-stuffs, oils, gums and resins, fibres, timbers, medicinal plants and products, with a view to their commercial utilization. Whenever necessary these materials are submitted to special scientific experts, by whom they are made the subject of particular investigation or practical tests. Reports are also obtained from technical or trade experts in regard to the probable commercial or industrial value of any such products, while full information is collected from official or other trustworthy sources regarding the probable extent and cost of available supplies.

Reports on the results of enquiries or experimental investigations are supplied as a rule, without charge, but should special expenses be incurred in connection with any such reports, or with the commercial value of particular materials or manufactured products, which the Council do not consider themselves warranted in meeting, a statement of such outlays will be furnished, for repayment, when the Reports are supplied. Should an investigation or report of exceptional character be asked for by a Government Department, an estimate of the attendant expenses will be submitted, with a view to ascertain whether authority for such expenditure will be given.

3. The Federated Malay States Government has undertaken to grant a sum of £100 a year for 5 years to the Department with a view to the careful investigation and commercial development of the mineral resources of the States.

The Government Geologist is collecting specimens for chemical examination and after analysis the Imperial Institute which is in very complete touch with the principal manufacturing and other industries of the United Kingdom, will bring the specimens before manufacturers and others for trial with a view to their commercial development.

It is expected that this action will do much to help in finding a market for new products and developing the markets for those already exploited.



AGRICULTURAL BULLETIN

OF THE

STRAITS

AND

FEDERATED MALAY STATES.

No. 11.] NOVEMBER, 1904. [Vol. III.

LAYERING RUBBER TREES.

Plates VII and VIII.

The tenacity of life in the Para rubber tree and its great vegetative powers are well known to many who have cultivated and observed it, and is well illustrated by the photographs of layered trees given with this number of the Bulletin. The trees shown in the plates were overset in a gale of wind some twelve or more years ago, when they were fairly big trees. The tops of the trees died off and the prostrate trunks threw up a various number of shoots, which have grown into strong trunks. The main trunk and a portion of the roots remain half buried in the soil, and can be seen in the figures. One tree has produced four, another six trunks of good size and thoroughly healthy and all have been tapped yielding good results. Others have produced two or three or more. No particular attention was paid to these trees during their growth, or it would probably have been possible to increase the number of the stems. The measurements of the stems now are the one with six stems from 18 to 24 inches circumference at 3 feet from the base, one with four stems 27 to 44, one with three stems 16 inches to 25. They averaged in tapping 8 ozs. of rubber at one tapping.

It will often happen in windy spots that trees will be overturned by a gale, and these photographs show it is by no means necessary to destroy trees so fallen. They should be laid quite prostrate and earth banked up along the fallen trunk about half way and the top of the tree should be cut off. In a few weeks shoots will appear often abundantly from the upper part of the trunk and these often produced in great abundance should be thinned out, till only eight or so are left and these at some distance apart.

In many places it may not be worth while to layer trees but the plan would be useful in very windy spots, for trees so layered cannot be blown over as they retain a strong hold on the ground, by

means of the prostrate primary trunk. Again specially good tree which have met with such an accident can be saved as has been done with a smaller sized tree in the Botanic Gardens, which produced an extraordinary flow of latex, but was unfortunately knocked over by another tree falling upon it.

The closeness of the large trunks produced will also be noticed in the photograph. The original tree had it not fallen would certainly not by this time have given so large an area of tapping bark, nor would it have been possible to have got single trees of the size of these stems on the same area of ground as the stems are, in the time in which these have taken to attain their present development. So that it will be seen that these layered trees besides being interesting as a curiosity may be also of some practical utility.—*Editor.*

EXPERIMENTAL RUBBER TAPPING AT THE BOTANIC GARDENS, SINGAPORE.

(*Continued.*)

The tables of three experiments of tapping by different methods have already been published and experiment IV is now put up. This experiment concerns the herring-bone mode of tapping only on trees tried of different sizes and shews the difference between tapping daily and on alternate days, and between morning and evening tapping. The result, although not absolutely so, confirms the opinion of the advantage of alternate over daily tappings and of morning over evening tappings. The exception occurs between No. I (daily) and No. III (alternate days) the small difference in this instance being in favour of daily tappings. With No. II and No. IV the difference in favour of tapping on alternate days will be noted and also the difference in the aggregate girth of the trees as favouring alternate days.

With large trees 3 feet and upwards the tappings were far from exhaustive and the scars were only moderate but they were stopped at the eighteenth tapping for the sake of uniformity. By referring to the tables attached for Nos. 2, 5 and 4, it will be seen that the eighteenth tapping in all the groups was normal and in some only slightly below maximum yield.

The Rubber has been prepared in the form of "biscuit" and contains a low percentage of moisture, probably under 2 per cent.

The result of the fourth experiment is as follows:—

Experiment IV.

Working Number.	Group.	Aggregate Girth at 3 feet from Ground.	Times Tapped.	Morning.		Evening.		Total Yield.		Herring-Bone Method.
				lbs.	oz.	lbs.	oz.	lbs.	oz.	
		Ft. in.								
I	I	22 8¾	18	5	4	...	...	...	...	
,,	II	23 0¾	18	4	3¼	...	...	9	7¼	Daily.
I	I	22 10	18	...	...	4	13¼	...	...	
,,	II	22 9½	18	...	...	4	2¾	9	0	Daily.
III	I	22 9¾	18	4	0½	...	...	...	...	
,,	II	23 2¾	18	4	10½	...	...	8	11	Alternate
III	I	23 4¼	18	...	...	4	5	...	...	
,,	II	22 1¾	18	...	...	4	7½	8	12½	Alternate
V	I	32 5	18	8	9	...	...	...	...	
,,	II	32 11¾	18	9	13	...	...	18	6	Alternate.
V	I	31 9	18	...	...	7	8	...	...	
,,	II	32 3¾	18	...	...	6	7	13	15	Alternate.
II	I	37 2	18	14	14	...	...	...	...	
,,	II	37 11½	18	14	12¼	...	...	29	6¼	Alternate.
II	I	37 7½	18	...	...	8	9	...	...	
,,	II	38 1½	18	...	...	11	7½	20	0½	Alternate.
IV	I	41 11¼	18	14	15¼	...	...	...	...	
,,	II	41 8	18	10	6¾	...	...	25	6	Daily.
IV	I	42 8¾	18	...	...	10	6¾	...	...	
,,	II	42 2½	18	...	...	9	10¾	20	1½	Daily.

R. DERRY.

Experiment IV (Morning).

GROUPS OF 10 TREES.

Reg. No. of Tree.	Working Number.	Registered Girth at 3 feet from Ground.	Mode of Incision.	Date.	Amount. Ounces.	Times Tapped.	Total Yield.	Average Yield per tree.	Comparative Yield per inch of Girth at 3 feet from Ground.	Remarks.
		Ft. in.		Sept.	*					
				21	$\frac{1}{4}$					
297		2 2	Herring-bone	22	$\frac{1}{2}$					
300		2 $3\frac{1}{4}$	Daily.	23	$1\frac{1}{2}$					
304		2 $4\frac{1}{4}$		24	3					
				26	4					
306		2 3		27	$6\frac{1}{2}$					
				28	$6\frac{1}{2}$					
310	I.	2 $0\frac{1}{2}$		29	$7\frac{1}{4}$		$74\frac{1}{4} \times 10$‡			
314	Group I.	2 $5\frac{1}{4}$		30	$6\frac{1}{4}$		$=84\frac{1}{2}$			
				Oct.			ozs.			
316		2 $4\frac{1}{2}$		1	6	18	$5\frac{4}{16}$ lb	8 ozs	Over $\frac{1}{4}$ ounce.	
321		2 4		3	7					
				4	Rain.					
322		2 $3\frac{1}{2}$		5	0					
				6	$5\frac{3}{4}$					
323		2 $2\frac{1}{2}$		7	Spoiled.					
				8	Spoiled.					
	Aggregate Girth ...	22 $8\frac{3}{4}$ †		10	$4\frac{1}{2}$					
				11	$3\frac{3}{4}$					
				12	$5\frac{3}{4}$					

* Nearly dry Biscuits. † Each tree between 2 feet and 2 feet 6 inches in girth. ‡ Rubber spoiled in experiment estimated 10 ounces.

Experiment IV (Morning).

GROUPS OF 10 TREES.

Reg. No. of Tree.	Working Number.	Registered Girth at 3 feet from Ground	Mode of Incision.	Date.	Amount. Ounces.	Times Tapped.	Total Yield.	Average Yield per Tree.	Comparative Yield per inch of Girth at 3 feet from Ground.	Remarks,
		Ft. in.		Oct.	*					
401		2 0¼	Herring-bone	14	¾					
441		2 1	Daily.	15	¾					
				17	4½					
446		2 2¾		18	5¾					
470		2 4¼		19	4¾					
				20	5¾		67¼ ozs.			
548	I Group III	2 5¾		21	5¼					
476		2 2		22	4½					
				24	4	18	4 3¼/16 lbs.	6½ ozs.	Under ¼ ounce.	
483		2 4		25	4					
				26	4					
488		2 5¼		27	4½					
499		2 5½		28	3¼					
				29	3					
504		2 6		31	3½					
	Aggregate Girth ...	23 0¾ †		Nov.						
				1	3¼					
				2	3					
				3	2¾					

* Nearly dry Biscuit. † Each tree between 2 feet and 2 feet 6 inches in girth.

Experiment IV (Evening).

GROUPS OF 10 TREES.

Reg. No. of Tree.	Working Number.	Registered Girth at 3 feet from Ground. Ft.	in.	Mode of Incision.	Date.	Amount. Ounces.	Times Tapped.	Total Yield.	Average Yield per Tree.	Comparative Yield per inch of Girth at 3 feet from Ground.	Remarks.
					Sept.	*					
		Ft.	in.		21	½					
329		2	4½	Herring-bone	22	1¼					
					23	2½					
335		2	0½	daily.	24	3¾					
336		2	4		26	5¼					
					27	6½		$73\frac{1}{4} \times 4$			
344	I	2	1¾		28	6		ozs = $77\frac{1}{4}$			
352	Group I.	2	3¾		29	5		ozs.			
					30	6¼	18	$4\frac{13\frac{1}{4}}{16}$ lbs.	8 ozs.	Over ¼ ounce.	
370	Evening.	2	2		Oct.				nearly.		
378		2	4¾		1	6					
					3	3					
383		2	5		4	5¾					
394		2	5¾		5	3¼					
					6	3¾					
397		2	2		7	spoiled.‡					
	Aggregate Girth ...	22	10†		8	4½					
					10	6¼					
					11	3¾					

* Nearly dry Biscuit. † Each tree between 2 feet and 2 feet 6 inches in girth. ‡ Rubber spoiled in experiment estimated 4 ounces

Experiment IV (Evening).

GROUPS OF 10 TREES.

Reg. No. of Tree.	Working Number.	Registered Girth at 3 feet from Ground.	Mode of Incision.	Date.	Amount. Ounces.	Times Tapped.	Total Yield.	Average Yield. per Tree.	Comparative Yield per inch of Girth at 3 feet from Ground.	Remarks.
		Ft. in.		Oct.	*					
507		2 0¼	Herring-bone	13	¾					
				14	¾					
511		2 4¼	Daily.	15	3½					
517		2 1¾	‡	17	5					
				18	4¾					
521		2 8		19	5¼					
525	I.	2 0¾		20	4					
	Group II			21	3¾					
535	Evening.	2 4¾		22	4					
536		2 4¾		24	5¼					
				25	3¼	18	66¾ ozs. $4\frac{2^3}{16}$ lbs.	7 ozs. nearly.	Under ¼ ounce.	
538		2 5		26	4					
540		2 1½		27	4					
				28	4					
542		2 2½		29	3¾					
				31	4					
	Aggregate Girth ...	22 9½ †		Nov.						
				1	2¾					
				2	4					

* Nearly dry Biscuit. † Each tree between 2 feet and 2 feet 6 inches in girth. ‡ Tree 521 crept in through an oversight.

Experiment IV (Morning).

GROUPS OF 10 TREES.

Reg. No. of Tree.	Working Number.	Registered Girth at 3 feet from Ground	Mode of Incision.	Date.	Amount. Ounces.	Times Tapped.	Total Yield.	Average Yield per Tree.	Comparative Yield per inch of Girth at 3 feet from Ground.	Remarks.
				Sept.	*					
		Ft. in.		21	¼					
70		2 4¼	Herring-bone	23	1½					
				26	2					
77		2 3½	Every other day.	28	4½					
93		2 0¾		30	6½					
				Oct.						
95		2 5		3	4¾					
97	III	2 4		6	4¾					
	Group I			8	Spoiled ‡		$60\frac{1}{2} \times 4$			
100	Morning	2 1		11	3¾	18	$=64\frac{1}{2}$ ozs 4 $\frac{0\frac{1}{2}}{16}$ lbs.	6 ozs.	Under ¼ ounce.	
102		2 5		13	5¾					
				15	3½					
115		2 3¼		18	3¼					
120		2 5¾		20	3¼					
				22	3½					
124		2 1¼†		25	4¼					
	Aggregate			27	3¼					
	Girth ...	22 9¾		29	2¾					
				Nov.						
				1	3					

* Nearly dry Biscuit.

† Each tree between 2 feet and 2 feet 6 inches in girth.

‡ Rubber spoiled in experiment on 8th Oct. estimated 4 ozs.

Experiment IV (Morning).

GROUPS OF 10 TREES.

Reg. No. of Tree.	Working Number.	Registered Girth at 3 feet from ground.	Mode of Incision.	Date.	Amount. Ounces.	Times Tapped.	Total Yield.	Average Yield per Tree.	Comparative Yield per inch of Girth at 3 feet from Ground.	Remarks.
				Sept.	*					
		Ft. in.		22	$\frac{1}{4}$					
140		2 $2\frac{3}{4}$	Herring-bone	24	1					
				27	$4\frac{1}{2}$					
144		2 $2\frac{1}{4}$	Every other day.	29	$6\frac{1}{2}$					
				Oct.						
147		2 5		1	$4\frac{3}{4}$					
150	III.	2 $3\frac{1}{2}$		4	Rain					
				5	$4\frac{3}{4}$					
155	Group II.	2 3		7	Spoiled ‡	18	$69\frac{1}{2} \times 5$ ozs.	$7\frac{1}{4}$ ozs.	Over $\frac{1}{4}$ ounce.	
160		2 $5\frac{1}{4}$		10	$5\frac{1}{4}$		$=74\frac{1}{2}$ ozs			
	Morning			12	$4\frac{3}{4}$		$4\frac{10\frac{1}{2}}{16}$ lbs.			
163		2 $5\frac{1}{2}$		14	$3\frac{1}{4}$					
				17	$4\frac{3}{4}$					
164		2 1		19	4					
167		2 $4\frac{3}{4}$		21	$5\frac{1}{2}$					
				24	5					
168		2 $5\frac{3}{4}$ †		26	$4\frac{1}{4}$					
	Aggregate Girth ...	23 $2\frac{3}{4}$		28	3					
				31	$3\frac{1}{2}$					
				Nov.						
				2	$4\frac{1}{2}$					

* Nearly dry Biscuit. † Each tree between 2 feet and 2 feet 6 inches in girth. ‡ Rubber spoiled in experiment on 7th Oct. estimated 5 ozs.

Experiment IV (Evening).

GROUPS OF 10 TREES.

Reg. No. of Tree.	Working Number.	Registered Girth at 3 feet from Ground	Mode of Incision	Date.	Amount. Ounces.	Times Tapped.	Total. Yield	Average Yield per Tree.	Comparative Yield per inch of Girth at 3 feet from Ground.	Remarks.
		Ft. in.	Herring-bone	Sept. 21	* Nil.					
175		2 3½	Every other day.	23	2¾					
				26	3¾					
178		2 4¾		28	5¼					
180		2 5		30	6¼					
				Oct.						
183		2 5		3	2½					
186	III.	2 4½		5	6					
214	Group I.	2 3¼		7	Spoiled ‡	18	64 × 5 =69 ozs. $4\frac{5}{16}$ lbs.	$6\frac{9}{10}$	¼ ounce nearly.	
				10	4½					
216		2 4¾		12	3¾					
				14	3½					
221		2 2		17	5					
225		2 5½		19	4					
238		2 2		21	4					
				24	3½					
	Aggregate Girth ...	23 4¼ †		26	3½					
				28	3½					
				31	2¼					

* Nearly dry Biscuit. † Each tree between 2 feet and 2 feet 6 inches in girth. ‡ Rubber spoiled in experiment estimated 5 ounces.

Experiment IV (Evening.)

GROUPS OF 10 TREES.

Reg. No. of Tree.	Working Number.	Registered Girth at 3 feet from Ground	Mode of Incision.	Date.	Amount. Ounces.	Times Tapped.	Total Yield.	Average Yield per Tree.	Comparative Yield per inch of Girth at 3 feet from Ground.
		Ft. in.		Sept.	*				
				22	$\frac{1}{4}$				
240		2 $2\frac{3}{4}$	Herring-bone	24	2				
244		2 $5\frac{1}{2}$	Every other day.	27	$6\frac{3}{4}$				
				29	$3\frac{3}{4}$				
249		2 $4\frac{1}{4}$		Oct.					
260		2 $2\frac{1}{4}$		1	$5\frac{1}{4}$				
				4	$4\frac{3}{4}$				
264	III.	2 4		6	$6\frac{1}{4}$				
				8	$4\frac{1}{2}$				
274	Group II	2 $0\frac{1}{4}$		11	3				
278		2 $2\frac{1}{2}$		13	Spoiled ‡	18	$67\frac{1}{2} \times 4$ $=71\frac{1}{2}$ ozs	7 ozs.	Over $\frac{1}{4}$ ounce.
				15	$4\frac{3}{4}$				
283		2 $1\frac{1}{4}$		18	$4\frac{1}{2}$		$4\frac{7\frac{1}{2}}{16}$ lbs.		
287		2 $0\frac{1}{2}$		20	$5\frac{1}{2}$				
				22	$3\frac{1}{2}$				
294		2 $2\frac{1}{2}$ †		25	$3\frac{1}{2}$				
				27	$2\frac{3}{4}$				
				29	$3\frac{3}{4}$				
	Aggregate Girth ...	22 $1\frac{3}{4}$		Nov.					
				1	$2\frac{3}{4}$				

Remarks.

Morning Tappings, Daily, I, Group I, lbs. 5. 4 } $9\frac{7\frac{1}{4}}{16}$ lbs.
" " I, " II, " 4. $3\frac{3}{4}$ }
Evening " I, " I, " } 9 { 4. $13\frac{1}{4}$ "
" " I, " II, " } { 4. $2\frac{3}{4}$ "
Morning " Alternte days, III, " I, " 4. $0\frac{1}{2}$ } 8. 11 "
" " III, " II, " 4. $10\frac{1}{2}$ }
Evening " III, " I, " } 8. $12\frac{1}{2}$ { 4. 5 "
" " III, " II, " } { 4. $7\frac{1}{2}$ "

* Nearly dry Biscuit. † Each tree between 2 feet and 2 feet 6 inches in girth. ‡ Rubber spoiled in experiment estimated 4 ounces.

Experiment IV (Morning).

GROUPS OF 10 TREES.

Reg. No. of Tree.	Working Number.	Registered Girth at 3 feet from Ground.	Mode of Incision.	Date.	Amount. Ounces.	Times Tapped.	Total Yield.	Average Yield per Tree.	Comparative Yield per inch of Girth at 3 feet from ground.	Remarks.
		Ft. in.		Oct.	*					
806		3 3⅛	Herring-bone.	5	¾					
821		3 3	Every other day.	10	5¼					
				12	7¾					
834		3 3½		14	8½					
				17	9½					
839		3 2¼		19	9½					
840	V.	3 3½		21	10½					
				24	9					
849	Group I.	3 1		26	7½	18	137½ ozs. $8\frac{9}{16}$ lbs.	13 ozs.	Over ¼ ounce.	
				28	7¾					
852		3 3⅜		31	6½					
863		3 4½		Nov.						
				2	9¼					
872		3 0⅛		7	6					
873		3 4⅜ †		9	6¼					
				11	9¼					
	Aggregate Girth ...	32 5		14	8¾					
				16	7½					
				18	8					

* Nearly dry Biscuit. † Each tree between 3 feet and 3 feet 6 inches in girth.

Experiment IV (Morning).

GROUPS OF 10 TREES.

Reg. No. of Tree.	Working Number.	Registered Girth at 3 feet from Ground.	Mode of Incision.	Date.	Amount Ounces.	Times Tapped.	Total Yield.	Average Yield per Tree.	Comparative Yield per inch of Girth at 3 feet from ground.	Remarks.
		Ft. in.		Oct.	*					
				6	1					
884		3 1	Herring-bone	11	$9\frac{3}{4}$					
885		3 0	Every other day.	13	$9\frac{1}{4}$					
				15	$12\frac{1}{2}$					
890		3 $4\frac{1}{8}$		18	$12\frac{1}{2}$					
897		3 5		20	$12\frac{1}{2}$					
901	V. Group II.	3 1		22	$14\frac{3}{4}$					
				25	13					
904		3 $2\frac{1}{4}$		27	14					
				29	$11\frac{1}{4}$	18	157 ozs. $9\frac{13}{10}$ lbs.	$15\frac{7}{10}$	Under $\frac{1}{2}$ ounce.	
911		3 4		Nov.						
915		3 $3\frac{1}{2}$		1	11					
				3	$5\frac{1}{4}$					
910		3 $3\frac{3}{8}$		8	$7\frac{3}{4}$					
923		3 $5\frac{1}{2}$ †		10	$5\frac{1}{2}$					
	Aggregate Girth ...	32 $11\frac{3}{4}$		12	$4\frac{3}{4}$					
				15	$4\frac{1}{2}$					
				17	4					
				19	$3\frac{3}{4}$					

* Nearly dry Biscuit. † Each tree between 3 feet and 3 feet 6 inches in girth.

Experiment IV (Evening).

GROUPS OF 10 TREES.

Reg. No. of Tree.	Working Number.	Registered Girth at 3 feet from Ground.	Mode of Incision.	Date.	Amount. Ounces.	Times Tapped.	Total Yield.	Average Yield per Tree.	Comparative Yield per inch of Girth. at 3 feet from Ground.	Remarks.
		Ft. in.		Oct.	*					
708	V. Group I	3 $1\frac{1}{4}$	Herring-bone	4	$\frac{1}{2}$					
710		3 $0\frac{1}{2}$	Every other day.	6	$1\frac{1}{2}$					
712		3 $1\frac{1}{4}$		8	$5\frac{3}{4}$					
716		3 $0\frac{1}{4}$		11	8					
721		3 $4\frac{3}{4}$		13	$8\frac{1}{2}$					
722		3 $0\frac{1}{2}$		15	$8\frac{3}{4}$					
724		3 $1\frac{3}{4}$		18	$8\frac{3}{4}$	18	$120\frac{1}{2}$ ozs. $7\frac{8}{16}$ lbs.	12 ozs.	Over $\frac{1}{4}$ ounce.	
726		3 $5\frac{1}{4}$		20	11					
739		3 $0\frac{1}{4}$		22	$7\frac{3}{4}$					
741		3 6 †		25	8					
	Aggregate Girth ...	31 $9\frac{3}{4}$		27	9					
				29	$7\frac{3}{4}$					
				1	$8\frac{1}{4}$					
				3	$7\frac{1}{2}$					
				5	8					
				8	5					
				10	2					
				12	$\frac{1}{2}$					

* Nearly dry Biscuit. † Each tree between 3 feet and 3 feet 6 inches in girth.

Experiment IV (Evening).

GROUPS OF 10 TREES.

Reg. No. of Tree.	Working Number.	Registered Girth at 3 feet from Ground.	Mode of Incision.	Date.	Amount Ounces.	Times Tapped.	Total Yield.	Average Yield per Tree.	Comparative Yield per inch of Girth at 3 feet from ground.	Remarks.
				Oct.	*					
		Ft. in.	Herring-bone	5	¾					
747		3 3½	Every other day.	7	2					V. Group I, Morning lbs. 8. 9 } =lbs. 18. 6
757		3 0¼		10	4					„ „ II, „ „ 9.13 }
761		3 1¾		12	5¼					„ „ I, Evening „ 7. 8 } =lbs. 13. 15
766		3 4¾		14	7¼					„ „ II, „ „ 6. 7 }
767	V.	3 3		17	7½					
771	Group II	3 0½		19	7					
774		3 5½		21	7¾					
785		3 0¾		24	6¾					
803		3 5¾		26	7¾	18	103 ozs. $6\frac{7}{16}$ lbs.	$10\frac{3}{16}$ ozs.	Over ¼ Ounce.	
936		3 2 †		28	7¼					
	Aggregate Girth ...	32 3¾		31	7¼					
				Nov.						
				2	5¾					
				4	6					
				7	5½					
				9	6½					
				11	4½					
				14	4¼					

* Nearly dry Biscuit † Each tree between 3 feet and 3 feet 6 inches in girth.

Experiment IV (Morning).

GROUPS OF 10 TREES.

Reg. No. of Tree.	Working Number.	Registered Girth at 3 feet from Ground.	Mode of Incision	Date.	Amount. Ounces.	Times Tapped.	Total Yield.	Average Yield per Tree.	Comparative Yield per inch of Girth at 3 feet from ground.	Remarks.
				Oct.	*					
		Ft. in.		5	1					
506		3 6¾	Herring-bone	7	5					
				10	9					
524		3 6½	Every other day.	12	11½					
527		3 8		14	14½					
				17	19¼					
533		3 11¼		19	16					
551	II	3 9		21	18¼		238 ozs.	1½ lb. nearly i.e. 1 lb. 8 ozs. nearly.		
579	Group	3 11⅞		24	19	18	$14\frac{14}{16}$ lbs.		Over ½ ounce.	
				26	15¾					
588	I	3 9¾		28	14¾					
				31	14¾					
591		3 6⅞		Nov.						
600		3 7½		2	14					
606		3 9¼ †		7	15					
				9	14½					
	Aggregate Girth ...	37 2½ †		11	12½					
				14	11¼					
				16	12					

* Nearly dry Biscuit. † Each tree between 3 feet 6 inches and 4 feet in girth.

Experiment IV (Morning).

GROUPS OF 10 TREES.

Reg. No. of Tree.	Working Number.	Registered Girth at 3 feet from Ground.	Mode of Incision.	Date.	Amount. Ounces.	Times Tapped.	Total Yield.	Average Yield per Tree.	Comparative Yield per inch of Girth at 3 feet from ground.	Remarks.
		Ft. in.		Oct.	*					
				6	$2\frac{3}{4}$					
608		3 $11\frac{1}{4}$	Herring-bone	8	$8\frac{1}{4}$					
613		3 $7\frac{3}{4}$	Every other day.	11	$11\frac{3}{4}$					
618		3 10		13	$14\frac{1}{2}$					
				15	16					
620		3 $10\frac{1}{2}$		18	$15\frac{3}{4}$					
622	II. Group II.	3 $7\frac{7}{8}$		20	$18\frac{3}{4}$					
				22	$18\frac{3}{4}$					
647		3 $9\frac{1}{2}$		25	$17\frac{1}{4}$					
660		3 $8\frac{1}{2}$		27	$14\frac{1}{2}$	18	$236\frac{1}{4}$ ozs. $14\frac{12\frac{1}{4}}{16}$ lbs.	$1\frac{7\frac{1}{2}}{16}$ lbs.	Over $\frac{1}{2}$ ounce.	
				29	14					
665		3 11		Nov.						
				1	$14\frac{1}{4}$					
682		3 $11\frac{3}{4}$		3	$15\frac{1}{2}$					
685		3 $7\frac{1}{8}$		8	$11\frac{1}{2}$					
				10	$12\frac{1}{2}$					
	Aggregate Girth ...	37 $11\frac{1}{4}$ †		12	$11\frac{3}{4}$					
				15	$9\frac{1}{2}$					
				17	9					

* Nearly dry Biscuit. † Each tree between 3 feet 6 inches and 4 feet in girth.

Experiment IV (Evening).

GROUPS OF 10 TREES.

Reg. No. of Tree.	Working Number.	Registered Girth at 3 feet from Ground.		Mode of Incision.	Date.	Amount. Ounces.	Times Tapped.	Total Yield.	Average Yield per Tree.	Comparative Yield per inch of Girth at 3 feet from ground.	Remarks
					Oct.	*					
		Ft.	in.		4	1					
680		3	6¼	Herring-bone	6	1					
					8	5					
688		3	10½	Every other day.	11	9					
695		3	9½		13	8¼					
					15	10					
698		3	7¼		18	9					
710	II	3	9¾		20	13					
					22	8¾					
720	Group I.	3	9¼		25	8½	18	137 ozs. $8\frac{9}{16}$ lbs.	13¾ ozs.	Over ¼ ounce.	
732		3	8¾		27	10					
					29	9¾					
738		3	9¾		Nov.						
750		3	9¼		1	8					
768		3	11¼ †		3	9					
					5	9					
					8	8					
	Aggregate Girth ...	37	7½		10	2¾					
					12	7					

* Nearly dry Biscuit. † Each tree between 3 feet 0 inches and 4 feet in girth.

Experiment IV (Evening).

GROUPS OF 10 TREES.

Reg. No. of Tree.	Working Number.	Registered Girth at 3 feet from Ground.	Mode of Incision.	Date.	Amount. Ounces.	Times Tapped.	Total. Yield.	Average Yield per Tree.	Comparative Yield per inch of Girth at 3 feet from ground.	Remarks.
		Ft. in.		Oct.	*					Very fine trees.
772		3 8¼	Herring-bone	5	1½					
				7	4¾					
835		3 11¾	Every other Day.	10	8¾					
				12	11¼					
837		3 6¾		14	13½					
				17	11¾					
841		3 11¼		19	13½					Group I. Morning lbs. 14.14
844	II.	3 11		21	14¼					II. " " 14.12¼ } =lbs. 29.6¼
845	Group. II.	3 8		24	14	18	183¾ ozs. 11 $\frac{7\frac{3}{4}}{16}$ lbs.	1 $\frac{2\frac{1}{4}}{16}$ lb.	Under ½ ounce.	" I. Evening 8. 9
				26	13					" II. " 11. 7½ } =lbs. 20. ½
848		3 11½		28	12					
850		3 9¾		31	7¼					
				Nov.						
868		3 8⅝		2	10					
882		3 10¾ †		4	11					
				7	10					
	Aggregate Girth ...	38 1½		9	10					
				11	10					
				14	7					

* Nearly dry Biscuit.

† Each tree between 3 feet inches and 4 feet in girth.

Experiment IV (Morning).

GROUPS OF 10 TREES.

Reg. No. of Tree.	Working Number.	Registered Girth at 3 feet from Ground.	Mode of Incision.	Date.	Amount. Ounces.	Times Tapped.	Total Yield.	Average Yield per Tree.	Comparative Yield per inch of Girth at 3 feet from ground.	Remarks.
		Ft. in.		Oct.	*					
				5	$1\frac{3}{4}$					
509		4 4	Herring-bone	6	4					
510		4 1	Daily.	7	7					
516		4 $2\frac{1}{4}$		8	10					
				10	$14\frac{1}{2}$					
549		4 $2\frac{1}{4}$		11	14					
550	IV.	4 2		12	$15\frac{1}{4}$					
				13	$13\frac{3}{4}$					
558	Group I.	4 $0\frac{1}{8}$		14	$15\frac{1}{4}$	18	$239\frac{1}{4}$ ozs. $14\frac{15}{16}$ lbs.	1. lb. $7\frac{3}{4}$ ozs.	Under $\frac{1}{2}$ ounce.	
502		4 $2\frac{3}{4}$		15	$15\frac{1}{2}$					
				17	$17\frac{7}{8}$					
577		4 $2\frac{3}{4}$		18	$15\frac{3}{4}$					
589		4 $4\frac{3}{8}$		19	$17\frac{1}{2}$					
				20	$15\frac{1}{2}$					
508		4 $1\frac{1}{2}$ †		21	16					
				22	16					
	Aggregate Girth ...	41 $11\frac{1}{4}$		24	$16\frac{1}{4}$					
				25	$13\frac{1}{2}$					

* Nearly dry Biscuit. † Each tree between 4 feet and 4 feet 6 inches in girth.

Experiment IV (Morning).

GROUPS OF 10 TREES.

Reg. No. of Tree.	Working Number.	Registered Girth at 3 feet from Ground.	Mode of Incision.	Date.	Amount. Ounces.	Times Tapped.	Total Yield.	Average Yield per Tree.	Comparative Yield per inch of Girth, at 3 feet from ground.	Remarks.
		Ft. in.		Oct.	*					
				26	$3\frac{3}{4}$					
715		4 $2\frac{1}{4}$	Herring-bone.	27	$3\frac{1}{2}$					
717		4 $1\frac{1}{4}$		28	$4\frac{3}{4}$					
728		4 $0\frac{3}{4}$	Daily.	29	$9\frac{1}{4}$					
				31	$12\frac{1}{4}$					
730		4 $2\frac{3}{4}$		Nov.						
				1	8					
745	IV	4 $1\frac{1}{2}$		2	$9\frac{3}{4}$					
758	Group II	4 $4\frac{1}{4}$		3	8					
894		4 1		7	$11\frac{3}{4}$	18	$166\frac{3}{4}$ ozs. $10\frac{6\frac{3}{4}}{16}$ lbs.	1 lb. $0\frac{3}{4}$ ozs.	Over $\frac{1}{4}$ ounce.	
				8	$12\frac{3}{4}$					
902		4 $4\frac{1}{4}$		9	$15\frac{1}{4}$					
938		4 $1\frac{1}{2}$		10	$11\frac{1}{4}$					
				11	$10\frac{3}{4}$					
1,024		4 $0\frac{3}{4}$†		12	$13\frac{1}{2}$					
				14	8					
	Aggregate Girth ...	41 8		15	8					
				16	$9\frac{1}{2}$					
				17	$6\frac{3}{4}$					

* Nearly dry Biscuit. † Each tree between 4 feet and 4 feet 6 inches in girth.

Experiment IV (Evening).

GROUPS OF 10 TREES.

Reg. No. of Tree.	Working Number.	Registered Girth at 3 feet from Ground.	Mode of Incision.	Date.	Amount Ounces.	Times Tapped.	Total Yield.	Average Yield per Tree.	Comparative Yield per inch of Girth at 3 feet from ground.	Remarks.
		Ft. in.		Oct.	*					
				4	$\frac{3}{4}$					
607	IV Group. I.	4 $0\frac{3}{4}$	Herring-bone.	5	$1\frac{1}{4}$					
627		4 $5\frac{1}{2}$	Daily.	6	$3\frac{3}{4}$					
632		4 $1\frac{3}{4}$		8	7					
640		4 $4\frac{1}{4}$		10	$8\frac{1}{2}$					
643		4 $5\frac{1}{4}$		11	$11\frac{1}{2}$					
675		4 $1\frac{1}{4}$		12	$11\frac{3}{4}$					
680		4 $4\frac{3}{4}$		13	$10\frac{1}{2}$	18	$166\frac{3}{4}$ ozs. $10\frac{6\frac{3}{4}}{16}$ lbs.	1 lb. $0\frac{3}{4}$ oz.	Over $\frac{1}{4}$ ounce.	
697		4 $4\frac{3}{4}$		14	11					
702		4 $0\frac{1}{4}$		15	12					
706		4 $4\frac{1}{4}$ †		17	$14\frac{1}{4}$					
				18	$11\frac{3}{4}$					
				19	$10\frac{3}{4}$					
				20	12					
				21	$10\frac{3}{4}$					
				22	$11\frac{3}{4}$					
	Aggregate Girth ...	42 $8\frac{3}{4}$		24	11					
				25	$6\frac{1}{2}$					

* Nearly dry Biscuit. † Each tree between 4 feet [illegible] inches and [illegible] feet 9 inches in girth.

Experiment IV (Evening.)

GROUPS OF 10 TREES.

Reg. No. of Tree.	Working Number.	Registered Girth at 3 feet from ground.	Mode of Incision.	Date.	Amount. Ounces.	Times Tapped.	Total Yield.	Average Yield per Tree.	Comparative Yield. per inch of Girth at 3 feet from ground.	Remarks.
		Ft. in.		Oct.	*					
				26	$5\frac{1}{4}$					
942		4 $2\frac{1}{2}$	Herring-bone	27	4					
				28	8					
956		4 $3\frac{1}{2}$	Daily.	29	11					
958		4 $4\frac{1}{2}$		31	$5\frac{1}{2}$					
959		4 $2\frac{3}{8}$		Nov.						
				1	$10\frac{3}{4}$					
962	IV.*	4 $2\frac{1}{2}$		2	$10\frac{3}{4}$	18	$154\frac{3}{4}$ ozs.	$15\frac{1}{2}$ ozs.	Over $\frac{1}{4}$ ounce.	
977	Group II	4 1		3	$10\frac{1}{4}$		$9\ \frac{10\frac{3}{4}}{16}$ lbs.			
				4	$12\frac{1}{2}$					
981		4 $1\frac{1}{4}$		5	10					
988		4 $4\frac{3}{4}$		7	$12\frac{1}{2}$					
				8	$7\frac{1}{2}$					
994		4 $1\frac{1}{2}$		9	8					
1007		4 $2\frac{7}{8}$ †		11	$9\frac{1}{2}$					
	Aggregare Girth ...	42 $2\frac{1}{2}$		12	9					
				14	$8\frac{1}{2}$					
				15	$3\frac{3}{4}$					
				16	8					

Remarks:

IV. Group I, Morning lbs. 14. $15\frac{1}{4}$ } = lbs. 25. 6
,, ,, II, ,, ,, 10. $6\frac{3}{4}$ }
,, ,, I, Evening ,, 10. $6\frac{3}{4}$ } = lbs. 20. 1
,, ,, II ,, ,, 9. $10\frac{3}{4}$ }

* Nearly dry Biscuit. † Each tree between 4 feet and 4 feet 6 inches in girth.

ASCLEPIAS CURASSAVICA.

Wild Ipecacuanha.

This plant probably introduced from South America is not at all a rare weed in the peninsula. It is a herb usually three or four feet tall, with narrow lanceolate leaves and a terminal head of very showy scarlet flowers with a bright yellow mass of stamens, (staminal corona) in the form of a crown in the centre. The fruit is an ovoid lanceolate pod, which splits and emits a quantity of flat seed with large silky plumes by which they drift about in the wind. Being one of the *asclepiadeæ*, the whole plant is full of latex, which exudes wherever it is broken. The plants is a very pretty one and worth cultivating as an ornamental plant. It is known to the Malays as Bunga Mas; Malukut Paya, and Bunga Sabusuk. They do not seem however to make any use of it.

Dr. WATTS (Dictionary of Economic Products of India) says that besides the emetic properties of the root, the expressed juice of the leaves is a successful anthelmintic, and also is a sudorific. The juice of the flowers is said to be a good styptic, the root is also a purgative and after an astringent, thus it is used for dysentery in Jamaica and the juice of the plant is useful in hœmorrhages and obstinate gonorrhea.

It has also been stated that if a dog be brushed down with a bunch of the plant it will be quite cleared of fleas.

The plant is quite common on open sandy country in Singapore and Malacca and elsewhere.

"*Wild Ipecac.*"

The unusually large arrival of 35 bales of a root known as wild "Ipecac" has taken place from Pernambuco, and although not offered at to-day's drug-auctions it was to be seen at the Crutched Friars drug-warehouse on Wednesday, when a certain amount of interest was shown in it. The root is identical in appearance with a sample in the warehouse museum, which is known as Trinidad *ipecac*, and came from that island. The late Mr. P. L. SIMMONS, in his work on drugs, states that the root (*Asclepias curassavica*) comes from the West Indies and Tropical America. It is known as wild or bastard ipecac, and is used by the negroes as an emetic and purgative. From another source we learn that it abounds in the islands of St. Kitts and Nevis, W. I., where it is largely used as a medicine. Both the root and the expressed juice are emetic. Dr. GRAIN has found in the *Asclepias curassavica* a glucoside, *asclepiadin*, which he believes to be a pure form of *asclepiadin* of Harnack and the *asclepin* of Feneulle, and closely to resemble emetine in its physiological action, but to be so unstable as to be of no practical value. Wild *ipecac* similar in character to the present consignment has occasionally been offered in auction, and has usually been sold as "roots" at a few pence per lb., as nobody appears to have gone to the expense of having it analysed. That this wild *ipecac* is abundant needs no proof but on account of its pale colour it is not so readily

adaptable for the purposes of adulteration as some of the other spurious *ipecacs.* That it will eventually be used for this purpose goes without saying. In the consignment under notice an overland sample was sent in the first instance, and this was submitted to a broker who pronounced the article to be "roots" of no medicinal value. For this expression of opinion the broker was taken to task, it being remarked from Pernambuco that "London knew nothing about the article," which, as a fact, was largely prescribed by doctors among the natives in South America. What London's opinion of the article is, will probably be known at the next drug-auctions: it may eventually find its way to the rummage sale.

The Chemist and Druggist Vol. LXV. p, 733.

MISCELLANEOUS.

NOTICES TO SUBSCRIBERS.

1. For the information of subscribers and others who wish to complete their series of Bulletins, notice is given that numbers 1, 7, 8 and 9, of the old Series (1891 to 1900) and Nos. 1, 8, 9 and 10, of New Series, Vol. I (1901-1902) have been reprinted and copies can be had by all whose subscriptions are paid up to date. The cost to others is 50 cents a number.

2. A very large number of subscriptions, even for last year, are yet unpaid although subscribers have received more than one notice of the delay in payment. As this entails a good deal of extra work on the staff, subscribers are asked to send in their subscriptions without delay. Attention is called to the rule that all subscriptions should be prepaid.

3. Subscribers changing their addresses are requested to give notice to the Editor.

4. Subscribers outside the Peninsula will in future be charged $3.50 per annum instead of $3 to cover postage.

Meteorological observers are asked to send in their returns to arrive before the 10th day of the following month, if possible, so as to be in time for going to press.

Rainfall for November, 1904 :—

Government Hill	...	Ins.	9·40
The Prison	...	„	10·65
The Fort	...	„	9·83
Balik Pulau	...	„	5·77
Pulau Jerejak	...	„	5·58
Lumut ...	...	„	7·43
Bruas ...	...	„	6·89
Pangkore ...	...	„	4·45

M. E. SCRIVEN,

Assistant Surgeon,

Penang, 8th December, 1904. *Prison Observatory.*

SINGAPORE MARKET REPORT.

November, 1904.

Articles.	Quantity sold.	Highest price.	Lowest price.
	Tons.	$	$
Coffee—Palembang	...	26.00	26.00
Bali	10	27.50	25.00
Liberian	56	28.00	25.50
Copra	3,451	9.30	8.10
Gambier	2,390	9.80	9.00
Cube Gambier, Nos. 1 and 2	312	14.50	13.00
Gutta Percha, 1st quality	...	200.00	150.00
Medium	...	100.00	90.00
Lower	...	80.00	19.00
Borneo Rubber 1, 2, and 3	...	136.00	87.00
Gutta Jelutong	...	8.30	8.00
Nutmegs, No. 110's	...	44.00	42.00
No. 80's	...	66.00	64.00
Mace, Banda	...	100.00	85.00
Amboyna	...	70.00	64.00
Pepper, Black	314	29.50	28.50
White (Sarawak)	594	43.25	40.50
Pearl Sago, Small	80	4.60	3.80
Medium	...	...	...
Large	...	...	...
Sago Flour, No. 1	3,132	3.65	3.35
No. 2	205	1.25	1.15
Flake Tapioca, Small	430	4.50	4.30
Medium	58	4.75	4.70
Pearl Tapioca, Small	477	4.55	4.30
Medium	654	4.55	4.30
Bullet	25	5.50	5.50
Tin	2,856	81.50	79.12½

Export Telegram to Europe and America.

For Fortnight ending 15th November, 1904.

Wired at 4.20 p. m. on 16th November, 1904.

					Tons.
10	Tin	Str.	Singapore & Penang	United Kingdom &/or	1,425
11	Do.	,,	Do.	U. S. A.	735
12	Do.	,,	Do.	Continent	381
13	Gambier	..	Singapore	London	...
14	Do.	,,	Do.	Liverpool	70
15	Do.	,,	Do.	U. K. & or Continent	190
16	Cube Gambier	,,	Do.	United Kingdom	130
17	Black Pepper	,,	Do.	Do.	30
18	Do.	,,	Penang	Do.	30
19	White Pepper	,,	Singapore	Do.	230
20	Do.	..	Penang	Do.	...
21	Pearl Sago	,,	Singapore	Do.	110
22	Sago flour	..	Do.	London	300
23	Do.	..	Do.	Liverpool	875
24	Tapioca, Flake	..	Singapore & Penang	United Kingdom	390
25	Do. Pearl	,,	Do.	Do.	460
26	Do. Flour	..	Penang	Do.	450
27	Gutta Percha	..	Singapore	Do.	10
28	Copra	,,	Singapore & Penang	Do.	...
29	Buffalo Hides	,,	Singapore	Do.	140
30	Pineapples	,,	Do.	Do.	cases 1,000
31	Gambier	,,	Do.	U. S. A.	775
32	Cube Gambier	,,	Do.	Do.	50
33	Black Pepper	,,	Do.	Do.	190
34	White Pepper	,,	Do.	Do	40
35	Black Pepper	,,	Penang	Do.	20
36	White Pepper	..	Do.	Do.	...
37	Nutmegs	,,	Singapore & Penang	Do.	60
38	Flake & Pearl	..	Do.	Do.	390
39	Pineapples	..	Singapore	Do.	cases 1,750
40	Do.	..	Do.	Continent	,, 1,000
41	Gambier	..	Do.	S. Continent	190
42	Do.	..	Do.	N. Continent	...
43	Cube Gambier	,,	Do.	Continent	60
44	Tapioca Flake	,,	Singapore & Penang	Do.	120
45	Do. Pearl	..	Do.	Do.	240
46	Copra	..	Do.	Marseilles	280
47	Do.	..	Do.	Odessa	...
48	Do.	..	Do.	S. Continent	480
49	Do.	..	Do.	N. Continent	200
50	Black Pepper	..	Singapore	S. Continent	110
51	Do.	,,	Do.	N. Continent	10
52	White Pepper	..	Do.	S. Continent	70
53	Do.	,,	Do.	N. Continent	60
54	Do.	.	Penang	S. Continent	10
55	Do.	..	Do.	N. Continent	...
56	Black Pepper	..	Do.	S. Continent	20
57	Do.	..	Do.	N. Continent	...
58	Sago Flour	..	Singapore	U. S. A.	...
59	Do.		Do.	Continent	1,700
60	Do.	..	Do.	Glasgow	20
61	Gambier	,,	Do.	Do.	...
62	Do.	..	Do.	U. S. A.	...

					Tons.
63	Flake and Pearl	Str.	Singapore	U. S. A.	...
64	Cube Gambier	,,	Do.	Do.	...
65	White Pepper	,,	Do.	Do.	...
66	Do.	,,	Penang	Do.	...
67	Pineapples	,,	Singapore	Do.	...
68	Gambier	,,	Do.	S. Continent	...
69	Copra	,,	Do.	Marseilles	...
70	Black Pepper	,,	Do.	S. Continent	...
71	White Pepper	,,	Do.	Do.	...
72	Black Pepper	,,	Do.	U. S. A.	...
73	Do.	,,	Penang	Do.	...

1,300 tons Gambier } Contracts
230 ,, Black Pepper }

Export Telegram to Europe and America.

For Fortnight ending 30th November, 1904.

Wired at 10.45 a. m. on 2nd December, 1904.

10	Tin	Str.	Singapore & Penang	United Kingdom &/or		1,600
11	Do.	,,	Do.	U. S. A.		850
12	Do.	,,	Do.	Continent		410
13	Gambier	,,	Singapore	London		...
14	Do.	,,	Do.	Liverpool		...
15	Do.	,,	Do.	U. K. &/or Continent		350
16	Cube Gambier	,,	Do.	United Kingdom		30
17	Black Pepper	,,	Do.	Do.		...
18	Do.	,,	Penang	Do.		...
19	White Pepper	,,	Singapore	Do.		40
20	Do.	,,	Penang	Do.		20
21	Pearl Sago	,,	Singapore	Do.		50
22	Sago Flour	,,	Do.	London		50
23	Do.	,,	Do.	Liverpool		...
24	Tapioca Flake	,,	Singapore & Penang	United Kingdom		200
25	Do. Pearl	,,	Do.	Do.		170
26	Do. Flour	,,	Penang	Do.		550
27	Gutta Percha	,,	Singapore	Do.		10
28	Copra	,,	Singapore & Penang	Do.		...
29	Buffalo Hides	,,	Singapore	Do.		70
30	Pineapples	,,	Do.	Do.		500
31	Gambier	,,	Do.	U. S. A.		975
32	Cube Gambier	,,	Do.	Do.		50
33	Black Pepper	,,	Do.	Do.		150
34	White Pepper	,,	Do.	Do.		20
35	Black Pepper	,,	Penang	Do.		10
36	White Pepper	,,	Do.	Do.		...
37	Nutmegs	,,	Singapore & Penang	Do.		23
38	Flake and Pearl	,,	Do.	Do.		490
39	Pineapples	,,	Singapore	Do.	cases	350
40	Do.	,,	Do.	Continent	cases	1,750
41	Gambier	,,	Do.	S. Continent		120
42	Do.	,,	Do.	N. Continent		120
43	Cube Gambier	,,	Do.	Continent		110
44	Tapioca Flake	,,	Singapore & Penang	Do.		180
45	Do. Pearl	,,	Do.	Do.		210
46	Copra	,,	Do.	Marseilles		400
47	Do.	,,	Do.	Odessa		...

					Tons.
48	Copra	Str.	Singapore & Penang	S. Continent	200
49	Do.	,,	Do.	N. Continent	920
50	Black Pepper	,,	Singapore	S. Continent	30
51	Do.	,,	Do.	N. Continent	40
52	White Pepper	,,	Do.	S. Continent	30
53	Do.	,,	Do.	N. Continent	80
54	Do.	,,	Penang	S. Continent	...
55	Do.	,,	Do.	N. Continent	20
56	Black Pepper	,,	Do.	S. Continent	...
57	Do.	,,	Do.	N. Continent	...
58	Sago Flour	,,	Singapore	U. S. A.	50
59	Do.	,,	Do.	Continent	460
60	Do.	,,	Do.	Glasgow	...
61	Gambier	,,	Do.	Do.	...
62	Do.	,,	Do.	U. S. A.	...
63	Flake and Pearl	,,	Do.	Do.	...
64	Cube Gambier	,,	Do.	Do.	...
65	White Pepper	,,	Do.	Do.	...
66	Do.	,,	Penang	Do.	...
67	Pineapples	,,	Singapore	Do.	...
68	Gambier	,,	Do.	S. Continent	...
69	Copra	,,	Do.	Marseilles	...
70	Black Pepper	,,	Do.	S. Continent	...
71	White Pepper	,,	Do.	Do.	...
72	Black Pepper	,,	Do.	U. S. A.	...
73	Do.	,,	Penang	Do.	...

900 tons Gambier } Contracts.
150 ,, Black Pepper }

Singapore.

Abstract of Meteorological Readings for the month of November, 1904.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
	Ins.	°F.	°F.	°F.	°F.	°F.	°F.	Ins.	°F	%		Ins.	Ins.
Kandang Kerbau Hospital Observatory	29·922	141·0	79·0	87·0	93·0	14·0	77·2	·866	75·5	80	W.S.W. & N.W.	7·90	1·58

A. B. LEICESTER,
Meteorological Observer

W. GILMORE ELLIS,
Principal Civil Medical Officer, S.S.

Kandang Kerbau Hospital Observatory,
Singapore, 16th December, 1904.

Penang.

Abstract of Meteorological Readings in the Prison Observatory for the month of November, 1904.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
	Ins.	°F	°F	°F	°F	°F	°F	°F	%	%		Ins.	Ins.
Criminal Prison Observatory	29·903	146·1	80·2	89·2	74·0	15·2	75·4	·787	70·78	71	N.W.	10·65	2·63

Colonial Surgeon's Office,

Penang, 9th December, 1904.

M. E. SCRIVEN,

Assistant Surgeon.

T. C. MUGLISTON,

Colonial Surgeon, Penang.

Malacca.

Abstract of Meteorological Readings for the month of November, 1904.

DISTRICT.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
	Ins.	°F	°F	°F	°F	°F	°F	°F	%	%		Ins.	Ins.
Durian Daun Hospital ..	29·839	162·2	79·5	89·6	70·4	18·9	80·9	1·44	62·7	95	N.E.	9·36	2·42

F. B. CROUCHER,

Colonial Surgeon, Malacca.

Colonial Surgeon's Office,

Malacca, 13th December, 1904.

Perak.

Abstract of Meteorological Readings in the various Districts of the State for the month of November, 1904.

District.	Maximum in Sun.	Temperature. Mean Dry Bulb.	Temperature. Maximum.	Temperature. Minimum.	Temperature. Range.	Hygrometer. Mean Wet Bulb.	Hygrometer. Vapour Tension.	Hygrometer. Humidity.	Total Rainfall.	Greatest rainfall during 24 hours.
Taiping ...	154	81·04	92	71	20	76·72	·862	82	16·73	2·66
Kuala Kangsar ...	...	79·46	92	70	20	75·64	·836	83	10·40	2·33
Batu Gajah ...	168	79·66	92	71	20	75·99	·850	85	10·11	2·22
Gopeng ...	...	79·08	92	63	28	75·34	·828	84	9·73	1·96
Ipoh ...	...	79·45	91	69	18	75·02	·810	80	6·86	0·96
Kampar ...	...	...	92	70	21	...	...	...	20·11	4·69
Teluk Anson ...	...	78·20	91	72	17	75·73	·857	89	6·19	1·51
Tapah ...	...	81·55	93	69	23	76·19	·833	78	10·65	2·48
Parit Buntar ...	...	81·68	91	71	19	77·06	·866	81	4·01	1·10
Bagan Serai ...	...	81·05	91	71	19	75·78	·824	77	9·63	4·05
Selama ...	...	80·88	90	71	18	76·91	·875	83	11·58	1·70

State Surgeon's Office,

Taiping, 12th December, 1904.

M. J. Wright,

State Surgeon, Perak.

Pahang.

Abstract of Meteorological Readings in the various Districts of the State for the month of October, 1904.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
Kuala Lipis ...	...	...	...	94·0	70·0	19·52	...	...	...	...	...	5·46	1·91
Raub ...	...	...	...	89·0	70·0	14·10	...	...	...	...	...	9·77	2·04
Bentong ...	...	...	...	91·0	72·0	12·64	...	...	...	...	...	7·11	1·80
Pekan ...	...	...	...	96·0	72·0	16·90	...	...	...	...	...	11·92	1·78
Kuantan ...	...	...	...	87·5	67·5	20·00	...	...	...	...	...	14· 7	3·67
Temerloh ...	...	...	...	92·0	72·0	20·00	...	...	...	...	...	4·48	1·02
						For No	*vember.*						
Kuantan ...	...	...	...	87·0	76·0	11·00	...	...	...	...	...	7·47	1.80

KUANTAN,

6th December, 1904.

State Surgeon, Pahang.

Muar.

Abstract of Meteorological Readings for the month of November, 1904.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature. Mean Dry Bulb.	Temperature. Maximum.	Temperature. Minimum.	Temperature. Range.	Hygrometer. Mean Wet Bulb.	Hygrometer. Vapour Tension.	Hygrometer. Dew Point.	Hygrometer. Humidity.	Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
Lanadron Estate ...	...	...	82°	90°	72°	18°	75°	...	...	...	...	6·28	2·10

Muar, 1st December, 1904.

ROGER PEARS.

The Duff Development Company Limited, Kelantan.

Abstract of Meteorological Readings for the month of November, 1904.

District.	Temperature. Mean Maximum.	Mean Minimum.	Mean Range.	Rainfall. Total Rainfall.	Greatest Rainfall during 24 hours.
	°F	°F	°F	Inches.	Inches.
Kuala Lebir ...	87·5	70·6	16·9	13·50	2·83
Bukit Segana, Ulu Liang ...	83·9	[illegible]	13·8	13·06	2·05
Kuala Kelantan ...	83·4	73·1	10·3	17·13	6·20

Kuala Lebir, [illegible]th December, 1904.

JOHN [illegible]. GIMLETTE.

No. 12.] DECEMBER, 1904. [Vol. III.

AGRICULTURAL BULLETIN

OF THE

STRAITS

AND

FEDERATED MALAY STATES.

EDITED BY

H. N. RIDLEY, M.A., F.L.S.,

Director of Botanic Gardens, S. S.

CONTENTS.

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AGRICULTURAL BULLETIN

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No. 12.] DECEMBER. [Vol. iii.

REPORT ON TERMES GESTROI AS AFFECTING PARA RUBBER (HEVEA BRASILIENSIS.)

By Herbert C. Robinson, *Curator, Selangor State Museum.*

I.—General.

The *Termitidæ*, or family of white ants, are a division of the Neuroptera, almost exclusively confined to the tropics, and numbering about 150 known species, arranged in four or five genera. The group has, however, been but little studied and probably includes at least 2,000 species. They are most abundant in Africa, Northern Australia and the Indo-Malayan region, but appear to be by no means so universally distributed in tropical South America. From the Malay Peninsula and Borneo, which are probably better known as regards their termite fauna than any other part of the world, about sixty species have been recorded referable to two genera, while very many more remain to be described.

The family has not hitherto been considered as very destructive to living plants. An unrecorded species (probably *T. taprobanes*) is known to destroy rambong seedlings in Assam, while another *(T. flavipes)* damages fruit trees in Florida by girdling them beneath the surface of the ground.

II.—Systematic.

The Malayan species are included in two genera, *Calotermes* and *Termes*. Members of the former genus, which is not very extensive, are nestless, do not as a rule build covered ways, and

are responsible, especially the species *Calotermes domesticus*, for the bulk of the damage done to buildings by white ants. A large number of the species of *Termes* build small spherical nests in trees or shrubs at varying heights from the ground and are of little or no importance from an agricultural point of view.

The following species are the only ones which are at all common on rubber estates, and may, it is hoped, be recognised by the following key, which is based on the characters of the soldiers, derived in the main from Dr. Haviland's classical paper on the subject.

III.—Key to Commoner Species of Termites.

I. Lobes of the thorax projecting over the underparts; head large and broad with powerful mandibles; legs projecting beyond the apex of the abdomen. Fungus growers.	
(i.) General colour above blackish	*Termes carbonarius.*
(ii.) General colour pale with rufous head—	
(*a*) Size larger; antennæ with 17 segments	*Termes malayanus.*
(*b*) Size smaller; antennæ with 15 segments	*Termes pallidus.*
II. Lobes of the thorax projecting but slightly over the underparts; head with a large foramen (hole) secreting milky fluid; mandibles fairly long but slender; outline of body oblong, head rufous, abdomen white, sometimes grey from intestinal contents	*Termes gestroi.*
III. Lobes of the thorax not projecting; species usually of a small size; abdomen arched—	
(i.) With slender mandibles; abdomen sulphur yellow	*Termes sulphureus.*
(ii.) Mandibles rudimentary; with a conical projection on head; general colour blackish brown—	
(*a*) Head much swollen	*Termes lacessitus.*
(*b*) Head but slightly swollen ...	*Termes umbrinus.*

IV.—Description of Species and their Nests.

Termes Carbonarius.

This is one of the largest species of termites and is by no means uncommon both in jungle country on land overgrown with lalang, and on abandoned tapioca estates, where it forms nests four or five feet high. It occasionally attacks coconuts, but does not do

any serious damage, being more of a nuisance from the nips the powerful mandibles of the soldiers can inflict on the coolies plucking the nuts.

When the plantations are allowed to grow up in grass, the termites do not seem to ascend the trees.

Termes Malayanus.

This is the species usually written of under the name of *Termes bellicosus*, which is an allied form, confined to Africa. The nest of the species varies much in shape according to the age of the community and the type of soil in which it has been built, but large mounds may be as much as six feet high and thirty feet in circumference. It has been well described and figured by Haviland (Journ. Linn. Soc. Zool., XXVI., pp. 381 *et seq.*) and I can confirm his observations in every respect.

The species constructs globular honey-combed masses of comminuted woody fibre and cultivates a species of fungus thereon, on which the young are fed. There is not the slightest evidence that this species does any harm to living plants, and much to the contrary, and it is a very moot point as to whether the money spent in eradicating their nests might not be better employed in other directions. Should, however, the nests be destroyed care should be taken that the whole mound is thoroughly levelled and the earth well broken up and exposed to the sun. It is of no use capturing the king and queen, as the community possesses the power of rapidly replacing them by special treatment of certain larval forms. The lenticular chambers seen on the sides of road-cuttings, etc., are in the majority of instances young communities or colonies from a large mound either of this or a closely allied species.

Termes pallidus.

A very much smaller species generally found nesting in the outer shell of the mounds of the preceding species. It also is a fungus grower and appears to be equally harmless.

Termes sulphureus.

A small species readily recognised by its arched abdomen, which is coloured pale primrose yellow. The nests of old and undisturbed communities are roughly cylindrical, tapering somewhat at the summit. Large nests are four or five feet in height and rather less in diameter, and are composed of a blackish grey material, more honey-combed and with far less earthy matter than that forming the nests of *T. malayanus*, and often excessively hard. The species is commoner on hill than on flat land and is not injurious.

Termes lacessitus.

Occasionally seen on the trunks of Para and Rambong but not doing any damage. Nest of papery material, usually on trees and shrubs in secondary jungle. A species of no economic importance.

Termes umbrinus.

This species nests in the stumps of dead trees and is often seen on the march in enormous numbers frequently travelling a distance of two or three hundred yards in columns a couple of inches wide. It apparently feeds on dead leaves, twigs, etc., and is occasionally seen in houses situated near jungle, but does not do any harm.

V.—Natural Habitat and Surroundings of Termes Gestroi.

Under normal conditions—*i.e.*, on unopened land—*Termes gestroi*, the only white ant with which we are concerned as an agricultural pest, is by no means a common species in the Federated Malay States.

It has been met with, but only sporadically, in low-lying jungle in the Kuala Selangor and Kuala Lumpur districts, and is fairly common in the neighbourhood of Rantau Panjang and behind Morib.

So far as has been observed, it is scarce or does not occur on granite and limestone soils, nor at any great elevation. Low laterite hills, covered with small jungle, and older jungle growing on land with a heavy clay sub-soil are the most favoured localities, but as it has been met with outside the zone of cultivation only on some twelve or fourteen occasions it is unwise to dogmatise on the point. It is evident that wherever it exists some natural cause must keep it rigidly in check, as otherwise the trees on which it feeds would probably become extinct.

VI.—Reasons for Present Abundance.

Its present abundance is only an instance of what frequently happens when the balance of nature is interfered with by the operations of man, and one has only to mention as a case in point, the plague of voles which occurred some years ago in the South of Scotland and which was directly traced to high game preserving and the consequent destruction of owls and hawks, the natural enemies of the insectivore.

The *Phylloxera*, too, originally an American insect, was never seriously dangerous to American vines, whose roots possessed the power of accommodation to the insect's attack. But when the American vine stocks, and with them the *Phylloxera*, were introduced into Europe, the native vines, which had not acquired this resisting power, were rapidly attacked and destroyed.

The conditions under which Para rubber is reputed to grow in its native forests are not such as would favour the co-existence of any great number of termites. The tree, therefore, when transported to this country, has to contend with difficulties to which the native Malayan trees have, under the stimulus of natural selection, become largely immune, and the increase of an otherwise unimportant member of the local insect fauna is abnormally stimulated.

VII.—Native Trees Attacked.

Among native trees *T. gestroi* appears mainly to attack species of the genus *Macaranga*, which, it is significant to note, belongs to the same natural order as *Hevea brasiliensis*. Jelutong (*Dyera costulata*) is also affected, but not to any serious extent, and so are various species of *Mango*, both wild and cultivated.

Grown under artificial conditions, tembusu (*Fagraea fragrans*) has been damaged, especially in the neighbourhood of Seremban and near Tampin. On one estate, where *Grevillea robusta* has been planted as a shade tree, the ants have practically exterminated it. Coconuts are also affected but not to anything like the same extent as Para rubber. Rambong is but slightly attacked, and when it is, generally survives, a result probably due in part to its constitutional powers of resistance and in part to its habit of growth.

VIII.—Age of Para when Attacked.

It is very rare for any material damage to be done before the tree is $3\frac{1}{2}$ years old, but I can find no satisfactory explanation of this undoubted fact. It may possibly be that *Termes gestroi* is naturally so scarce and scattered that it takes an appreciable time for a sufficient stock to accumulate, but more probably the species cannot work without a minimum amount of shade, which is not afforded until the age of 3 to 4 years is attained. A third theory, to which a certain amount of plausibility attaches, is that the nests of the ants, as with certain South African species, are normally situated at a considerable depth beneath the surface, to which the roots of the rubber do not extend until the age of about four years, though this again is discounted by the situation of the nests as actually found.

IX.—Influence of Soil upon T. Gestroi.

It has been demonstrated from returns sent in and from various typical estates visited, that, other things being equal, the damage caused by this pest varies more or less directly with the heaviness of the soil, light sandy loams being almost unaffected, while heavy clay soils have sometimes as many as 25 per cent. of the trees attacked. As regards drainage it is impossible to lay down any general rule. Swamp land is almost free from any species of termite, but, on the other hand, where the natural water level lies far beneath the surface termites can penetrate to a correspondingly great depth, and speaking broadly it may be said that the hill country estates in Negri Sembilan are more badly affected than those of the flats in Selangor, though possibly other causes may also have contributed to this.

Taking all considerations into account, it has, I think been fairly demonstrated that the land best suited to Para rubber is a fairly stiff soil, capable of retaining a certain amount of moisture during drought, which is provided with a thoroughly efficient system of drainage. The slightly increased percentage of trees

destroyed by ants in such a situation as compared with a light soil is probably far more than compensated for by the quicker and more luxuriant growth of the trees that escape.

X.—Spacing.

The distance between the trees is also a decided factor in their liability to attack, the wider the spacing the smaller being the proportionate number of trees lost. This is no doubt due to the desiccation of the trunks and surface soil by the sun's rays. This slight advantage seems to be far more than counterbalanced by the much smaller return per acre and the slower growth of the trees when widely planted.

XI.—Influence of Season.

White ants are much more active during periods of heavy rain, or rather immediately after such rain.

XII.—Method of Attack.

The methods of attack of *T. gestroi* are eminently characteristic, and when once their earthworks are seen and recognised, they can never be mistaken for those of any other species. The tree seems first of all to be prospected, by two or three tunnels run straight up the trunk ; if the indications are favourable the whole circumference is then rapidly invested by a thick layer of mud, under cover of which the ants speedily eat down to the cambium. The vast majority of attacks by individual termites are repelled by the cambium, but sooner or later a non-resistant spot is reached and the whole body of termites gains access to the interior of the tree, which is rapidly eaten out and falls. In a very considerable percentage of cases, there are no external signs of damage, and the insects enter the tree either by a lateral root from a point beneath the surface of the soil, or by way of the taproot itself. In such cases the tree may appear perfectly sound, until it falls or is blown over. Damage is caused not so much by the actual death of the tree, for in many cases the living tissues are perfectly sound, but from the weakening of the trunk and taproot added to the natural brittleness of the wood, rendering them unable to resist the slightest wind pressure. On certain estates it has been noted, that where tapping has been somewhat roughly performed, and the cambium extensively cut into, white ants have gained access through the scars thus produced. It is therefore highly important that the cuts should be made down to but not into the cambium layer, as is the case on the Sungei Rengam Estates, where in no single instance have ants secured a foothold in the manner indicated above.

XIII.—General Bionomics of Termes Gestroi.

I have not been successful, nor, so far as I am aware, has any other naturalist, in finding the king and queen of *Termes gestroi*. Amongst numerous communities investigated one was

found containing immature winged forms and eggs, but careful search failed to reveal anything in the nature of a royal cell, which in all probability is not built by this species. The vast majority of nests contain merely soldiers and workers, and I concur with Dr. Haviland in thinking that it is extremely probable that the greater number of communities are without king or queen and are merely offshoots from some central nest, from which immature forms, and possibly eggs, are conveyed. Under conditions with which we are at present unfamiliar, it is not unlikely that sexually active males and females may be produced by post-metamorphic changes. The termitaria or nests are contained within the trunks of the trees attacked and are formed of narrow labyrinthine chambers composed of woody and earthy matter that has passed through the alimentary canal of the insects, the whole of the interior of the tree being more or less filled up with this material, which replaces the wood as it is eaten away. Judging from the state of development of the immature winged forms above referred to, it is probable that the swarming season, like that of the other species of termites in this country, is from September to Christmas, and it is before and during this period that repressive measures should be most energetically carried out. It appears too, that on any given estate, the *centres* of attack are comparatively few in number, and there is therefore the more reason to believe that if vigorous preventive measures are persevered in for a considerable time, the pest will gradually abate.

XIV.—Natural Enemies of Termites.

The most important enemies of termites are undoubtedly the true ants, which may often be seen carrying off the workers to their own nests. Three specially active species are the kĕringa (*Oecophylla smaragdina*) a small red species of *Camponotus* often seen running about the trunks of the rubber, and a very long-legged, slender black species, also probably a *Camponotus*, whose nests are often found inside the termitaria, and seem to be regularly provisioned with larval white ants. Of the vertebrates, bears are reputed to occasionally break open the larger mounds, and I have seen the stomach of a binturong crammed with a small jungle-dwelling species. Birds of many varieties gorge themselves with the winged forms during swarming. Frogs and toads, including *Megalophrys nasuta*, *Bufo melanostictus* and *Callula pulchra*, also live largely on termites.

None of those enemies, however, could be made any practical use of, but it might be possible to utilise the services of a species of South African mongoose, *Herpestes badius*, subsp. *gracilis*, which experiment* has shown to feed almost entirely on white ants. Ventures in acclimatisation, however, are always hazardous, and often end in the most unlooked for and unwelcome results.

---

* Report of the Hope Professor of Zoology, Oxford 1903, p. 53.

XV.—Remedies.

Of the host of remedies tried, it cannot be said that a single one has shown itself a conspicuous success. From the habits of the pest, as detailed in a previous paragraph, it is obvious that no ordinary insecticide can be effectual, as it is rapidly bridged over by earth, in the case of external attacks, whilst it cannot readily be applied internally. "Gondal's Fluid," a peculiarly malodorous compound containing assafœtida, London purple, copperas, petroleum, an extract of vasumba root, tuba and other direct poisons have been tried with practically no effect. At Jugra, Mr. Baxendale is using applications of hot water with satisfactory results, but his estate is by no means badly infested, and the method would probably be impracticable on at all an extensive scale, and is at best a palliative.

The most successful treatment yet devised is to thoroughly scrape off all incrustation from the tree, taking care to kill the ants in so doing, and to powder the trunk thickly with freshly-slaked lime, applied in a dry state. The earth round the base of the tree should be removed to the depth of a foot or eighteen inches, and a liberal dressing of dry-lime applied. The trees should be inspected every other day, and treatment repeated if necessary.

It is a well-established fact, that white ants are very intolerant of any form of decaying animal or of fœcal matter, and should the materials be available a compost of cow-dung applied to the tree might be efficacious in repelling the external attacks, while night-soil dug in to the base of the tree might ward off internal attack. The treatment of affected trees with a small quantity of an ammonium salt, preferably the sulphate, might not improbably have the same action, as Dr. Wright, of Perak, informs me that urine applied to damaged trees rapidly drives off the ants, the result apparently depending on the production of ammonia during decomposition. The saving of trees attacked from the tap root, or beneath the ground level, is a far more difficult matter, for, as noted in previous paragraphs, there is very frequently no indication of damage. Should this be detected in time, the base of the tree should be well exposed and treated with lime. If large cavities exists, two or three ounces of carbide of calcium should be introduced, with a little water, and the aperture plugged with damp clay. The acetylene gas thus produced is a fairly powerful insecticide, but its usefulness is impaired by its great diffusive power and consequent ephemeral effect. Carbon bisulphide has been suggested as suitable, and there is no doubt that this chemical is a most valuable insecticide which could be put to a multitude of uses in this country if only it was procurable at a reasonable cost and with some regularity. In England it is much used for freeing grain from weevils and could be applied to rice in this country for a similar purpose. I do not, however, think that the apparatus suggested by

Mr. Bamber would prove workable in practice ; it would certainly be cumbersome, extremely wasteful, and probably very deleterious to the coolies working it. Its efficacy would probably depend rather on the amount of sulphur vapour and sulphur dioxide formed, than on its output of carbon bisulphide. I have gone into the question in detail, and believe that the chemical could be produced in bulk in this country at a far less cost than it would be possible to import it for, when the prohibitive freight and heavy loss in transport is taken into account. My estimates and the facts on which they are based are embodied in Appendix *A*.

XVI.—Summary.

Summarising the above information, it may fairly be taken as proved :—

(*a*) That *Termes gestroi*, comparatively a scarce and unimportant species under conditions normal to the country, has risen to the rank of a serious agricultural pest, owing to the provision in large quantities of a suitable food tree ;

(*b*) That the damage caused to estates is, in the main, due to termites bred within their limits, and not in the adjacent jungle ; otherwise trees near the boundaries would be most affected, which is not found to be the case ;

(*c*) That less damage occurs on light soil, and when the spacing is very wide, but that this is far more than counterbalanced by the more vigorous growth and better return per acre on heavier soil more thickly planted ;

(*d*) That the mischief is most active in rainy weather ;

(*e*) That the nests of the termites are to be found inside the trunks of the trees destroyed, and that these nests swarm—*i.e.*, attempt to form new communities—some time between September and Christmas ;

(*f*) That no species of termite other than *T. gestroi* is injurious to living Para ;

(*g*) That the attacks of the termites do not appear to be due to antecedent disease fungoid, or otherwise, though sometimes induced by mechanical injury to the cambium.

XVII.—Recommendations.

I have to make the following recommendations :—

(*a*) That where possible, planting be carried out by means of seed at stake and not by stumps ;

(*b*) That when affected externally, trees be treated with dry lime in accordance with previous paragraphs, and that when internal damage is suspected, by means of carbon bisulphide vapour forced into the cavities by means of a small pump fitted with three valves, one for admission of carbon bisulphide, from an attached receiver, one for admixture of air near the end of the stroke, and one for the expulsion of

the gaseous mixture. A rough diagram * is included in Appendix A. Failing carbon bisulphide, solid calcium carbide may be used ;

(*c*) That whenever a tree falls from the attacks of white ants, it should be split open, the earthy matter within removed and well mixed with lime, the stump dug out and burnt together with the trunk. The hole should be filled in with earth and lime and ground changkoled within a radius of 20 feet. This should be done immediately on the fall of the tree and especial promptitude is indicated if the event happens at all near the swarming season ;

(*d*) That the larger mound-building species be not interfered with, as in this country they largely take the place of earth worms in more temperate climates, and play an important part in the economy of nature by rapidly converting dead timber and decaying vegetable matter into a form immediately available for plant nutrition ;

(*e*) That the possibility and even probability of mismanaged and neglected estates becoming a breeding ground for *T. gestroi* and hence a source of danger and expense to their neighbours, be seriously considered by the Planters' Association.

XVIII.—Conclusion.

In conclusion, I must express my acknowledgments for the great assistance rendered to me by the planting community in general, and to Mr. P. W. Parkinson, of Sungei Rengam Estate, in particular, to whom I am indebted for much material aid and many valuable suggestions, which are embodied in the present report.

HERBERT C. ROBINSON,
Curator.

Selangor State Museum,
Kuala Lumpur, *13th October, 1904.*

APPENDIX A.

Manufacture and use of Carbon Bisulphide.

Theoretically, 100 lbs. of sulphur should yield 119 lbs. of carbon bisulphide, but after allowing for leakage and loss from imperfect

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* Not printed.

condensation, it will be safe to assume that 150 lbs. of sulphur are required to produce 100 lbs. of CS_2.

Plant and building; capital cost ... $2,500

Monthly production 600 lbs.

* Sulphur, 8 cwt. at $12.50	$100
Charcoal, 10 cwt. at $1.50	15
Firewood, etc.	50
Wages	40
Interest on capital 10%, sinking fund 15%	52
Repairs	40
	$297

or, roughly speaking, 50 cents per lb.

With a consumption of 1,200 lbs. per mensem we have—

Establishment charges	$132
Cost of materials	330
	$462

or, $0.39 per lb., which is a very great deal lower than carbon bisulphide can possibly be imported for. The cost of materials, of wages, repairs, and capital cost of apparatus have been estimated at a very much higher rate than is likely to prevail, an exceedingly low condensation factor has been assumed, and a liberal allowance made for interest and sinking fund.

I would, nevertheless, suggest that previous to any action being taken, the Government should instruct the Crown Agents to refer the question to either Professor Tilden, F.R.S., Professor of Chemistry, Royal College of Science, or else to Professor T. E. Thorpe, of Somerset House, with the request that they should obtain plans for a plant on the following scale:—

Daily production required	70 lbs.
Working hours per day	7
Working days per month	20
Temperature of condensing water ...	80° F.

All parts to be easily accessible, readily replaced and as uncomplicated as possible.

APPENDIX B.

Other Insect Enemies of Rubber.

With the exception of *Termes gestroi* both Para rubber and Rambong are singularly free from insect pests of all descriptions.

* Present price in London, retail, 16/–per cwt.

The following are the only species that have been noticed as doing damage, and in all cases the damage has been quite insignificant, and shown little tendency to spread.

1. *Eumeces squamosus.*—A weevil about $\frac{1}{2}$ inch long and covered with powdery scales of a greenish or yellowish tint, which are readily rubbed off, when the insect becomes of a dull black colour. The adults cause injury by defoliating the trees, but the grubs are harmless. Described in the "*Agricultural Bulletin*" for January and July, 1904.

2. *Anthribid sp.*—A mottled grey and black beetle about $1\frac{1}{4}$ inch long, with antennæ (in the male) more than twice the length of the body, but shorter than half the body in the female; head of large size, elongated, and set at right angles to the body. Very common in this country. A single specimen was caught emerging from the trunk of a Para tree, and others have been seen flying about plantations. The larvæ of this family of beetles are normally feeders on wood.

3. *Epepeotes luscus.*—Size very variable from $\frac{3}{4}$ to $1\frac{3}{4}$ inch; antennæ more than twice the length of the body; general colour blackish, mottled with pale cream, a velvety black spot on each shoulder, surrounded by a narrow cream line. A very common species, the larvæ, like those of the majority of the Longicorns, feeding on wood. Found once on the trunk of a Para rubber tree.

4. *Clytanthus annularis.*—(Longicorn). A narrow insect about $\frac{1}{2}$ to $\frac{3}{4}$ inch long by $\frac{3}{16}$ inch or less broad; antennæ filiform, not so long as the body; general colour mustard yellow varied with black. A common and wide-spread insect, found *once* ovipositing on the stems of Para seedlings. Somewhat closely allied to the coffee borer of Southern India.

5. *Aspidiotus sp.*—A scale insect apparently belonging to this genus has once been noted on Para, but nothing more has been heard of it.

6. Small beetles of the families *Bostrychidæ* and *Scolytidæ* frequently attack the bark of Para rubber. Their efforts seem, however, to be frustrated by the latex, which exuding from the wounds coagulates round the head of the beetle and stops further progress.

7. The larvæ of a small moth, greyish-brown in colour with a pinkish tinge, and about $\frac{3}{8}$ of an inch in spread, has sometimes been found feeding on Rambong and may possibly attack Para. The species appears to be closely allied to, if not identical with, *Rhodoneura myrsusalis* found in Brazil, Natal, India, Ceylon, Burma and Borneo. The food plants in this country are species of *Palaquium* (getah taban) in whose rolled-up leaves the larvæ pupate, and the trees are damaged considerably both in a wild and cultivated state. The rigid leaves of *Ficus elastica*, however, are not quite suited to the habits of the larvæ, and the damage at present effected is hardly noticeable.

It will be unwise, however, to allow taban to be planted in the immediate vicinity either of Para or Rambong.

Notes on the above Paper.

Mr. Robinson says that *Termes umbrinus* apparently feeds on leaves and twigs. It, however, is a fungus grower, and the workers collect scrapings of algae and fungi apparently, from bark of trees, posts, etc. It often makes its nest in the fork or at the base of trees, especially large ones, and frequently causes decay of the bark and wood beneath, and sometimes puts its nest in houses or stores, between the beams, which sooner or later decay, otherwise it does no harm.

Among trees I have seen attacked by *Termes gestroi* are the marking nut. *Semecarpus anacardium; Mimosa sepiaria*, and *Garcinia andersoni*. I have never seen it attacking trees when grass is grown round them, and it is quite possible that trees grown as they are in the Botanic Gardens in grass would not be attacked at all. Experiments are wanted in this direction.

Influence of soil upon termites is certainly as Mr. Robinson states. In sandy soil the underground termites cannot make nests as they would collapse. I noticed a great absence of termites in the sandy woods of Pahang, nor are there any in the damp parts of the garden where a quantity of the rubber trees are growing. *Termes gestroi* is strictly a woodland species, and disappears altogether in land that has been long under such cultivation as indigo or sugar, even if this land has been allowed to revert to scrub.

With respect to the remedies proposed by Mr. Robinson, while it is true that termites object strongly to nightsoil, or decaying animal matter this does not apply to the dung of herbivorous animals. Horse or cow dung when at all dry is often removed to the nest very quickly by *Termes Malayanus*.

As to the use of the mound building species of termites in playing the part of earth worms here, as they certainly do in Africa, I have long ago pointed out (*Bulletin*, *Old Series*, *p.* 82) that it may be considered extremely doubtful whether they do not so destroy the dead timber, etc., that it is useless as plant food.

Under the heading natural enemies of termites, Mr. Robinson has somehow omitted the Tengiling or Scaly manis (*Manis Javanica*). This animal lives almost exclusively on termites, chiefly on *T. Malayense*, burrowing into the nests and licking up the termites with its long tongue. It is quite common, but as it only comes out of the ground at night it is comparatively rarely seen.—Ed.

WEED-PESTS.

In many agricultural journals one may read of pestilential plants accidentally or intentionally introduced by man from other parts of the world, which grow to such an extent that they become a nuisance, and are often very difficult to eradicate. In the "*Journal d'Agriculture Tropicale, Paris* (*No.* 35, *May* 31, 1904), M. DES GROTTES writes: "That the introduction of new "plants into our Colonies requires much circumspection and "careful preliminary study, for whilst some are useful others are noxious." Among the noxious plants he places the Guava. Other gardeners have the same cautious fear I find of introducing a plant to their country which may possibly become a noxious weed. It is, however, a fact that plants with the worst possible reputation as weeds, often under apparently exactly the same circumstances of soil and climate, refuse to take to the country at all, and are quite harmless. A species of *Oxalis* is a pest in the tea gardens of Ceylon. It grows by underground tubers, and is difficult or almost impossible to eradicate. In the Malay Peninsula, however, it hardly manages to exist, except on such spots as Penang Hill, where it thrives but is quite easily disposed of. *Argemone Mexicana*, an ornamental poppy, has established itself as a pest in many parts of the world, and due caution was exercised in introducing it as a bedding plant into Singapore. It grew, flowered, seeded, apparently well the first year and utterly vanished the second year.

In the Antilles M. DES GROTTES declares that the Guava has run wild, is terrible prolific, and the roots are very hard, sink deep into the soil, and are very troublesome to eradicate. The seeds are dispersed by cattle and pigs and also by birds. In the Malay Peninsula the Guava is very widely cultivated, and occasionally seedlings spring up here and there in waste ground, but it is very far from establishing itself as a pest. It reproduces very slowly in a half-wild state. The reason for this is probably that civet cats and bats eat the fruit before it is ripe, so that no seedlings are produced. I have but rarely seen a ripe fruit on a half-wild seedling Guava here, though where the fruit is protected to some extent in gardens it fruits very well.

Among plants accidentally introduced into the Malay Peninsula which have become more or less of a nuisance are the sensitive plant *Mimosa pudica*, the large shrub *M. sepiaria*, the common Lautana, *Lautana mixta*, lalang, *Imperata cylindrica*, *Limnocharis plumieri*, an ornamental plant cultivated by the Chinese for pig-food which has wandered into ditches and rice-fields, and some other weeds.

The most curious thing about many of these weeds is the way that at first they seem to grow with great rapidity and prove a general nuisance, becoming extremely abundant, and then seem almost as fast to die away and become scarce, or at all events not more common than any other plant.

The *Lantana mixta*, formerly very abundant in Singapore as well as elsewhere in the Peninsula, was considered a pestilential weed, being of rapid growth and forming dense thickets difficult to eradicate, but now seems to have disappeared to a very large extent, and is hardly worth considering as a pest. The sensitive plant, *Mimosa pudica*, has quite disappeared in many spots where it was formerly abundant.

Synedrella nodiflora, a common South American weed, is abundant in Singapore, but does not rank as a particularly noxious plant. Its fruit, adhesive to cloth, etc., by its sharp spines, got conveyed somehow to Christmas Island, where it throve round the settlements so that it forms great patches of weed, which drying up in the dry season are annoying from their inflammable nature. There, however, weeds are comparatively scanty as yet, so that it can hold its own. Doubtless in time it will become less agressive as other weeds get introduced and compete with it. The nut grass *Cyperus rotundus*, one of the sedges, was formerly a very troublesome weed in the Gardens at Singapore. It is a common plant all over warm countries, and is particularly troublesome on account of its underground tubers, which are produced on long creeping stems, so that when the plant is dug out of the ground it is impossible to avoid leaving some tubers in the ground which quickly spring up again. The plant almost disappeared from the Gardens at one time, though annoyingly abundant previously, but of late years reappeared in some quantity and again required extirpation. Very few of these weeds hold their own and become very abundant pests for any great length of time in one spot, but there are some which undoubtedly do so, and the best known of these is the Lalang grass, which has occupied the same ground in some places for a very great number of years so far as is known, but even that in time gets driven out frequently by other plants. The cause of any given plant becoming an excessively abundant pest and then dying out is not at all clear. In some cases it will be found that it only becomes a pest when it practically has the monopoly of the ground, but gradually other weeds get in and eventually the monopolist is killed by competition. Lalang chiefly holds the ground by virtue of its having its persistent rhizomes at a considerable depth below the surface of the soil. The leaves and flower stalks are very inflammable when dry, and in many places being often fired any other competitive weeds growing through it, together with their seeds lying on the surface of the ground, are destroyed, while the lalang itself is unhurt, and immediately shoots up again. Where the lalang is prevented from being burnt the creeping grasses may get in and drive the lalang out by covering the ground with a mat of creeping stems.

The Purslane, *Portulaca ubracea*, a weed probably of seashore origin whose native home is not known, is much disliked by planters, though really much less harmless than most weeds. It can only grow on almost or quite bare ground, so that it is

absolutely commoner in carefully weeded estates than in weedy spots. It cannot stand competition with other weeds.

A very troublesome weed in the damper parts of the Botanic Garden is the African *Sparganophorus Vaillanti*. It seems to seed very fast, and when hoed out of the beds comes up again very quickly. How it got into Singapore is not known, and it does not seem to have spread to any great extent, though very abundant where it occurs.

In conclusion, one may say that wherever there is cultivation there will be weeds of some kind, plants which are not wanted and which become a nuisance. Some, like the Lalang, are more difficult to eradicate than others. But it is practically impossible to foretell whether in any given country any plant will become a nuisance or not. A plant which gives no trouble in one place may be a great trouble in another, and *vice versa*. All depends on the competition with other weeds it meets with, and its power of reproducing itself by seed, which in many places varies for no reason that can be accounted for.

The only thing that one can certainly say is that shrubby weeds are usually more difficult to eradicate than herbaceous ones, and that those which propagate themselves readily by underground suckers, or tubers, are more difficult to extirpate than annual, or short-lived plants which reproduce by seed only.

There is, I have found, a considerable variety of opinion among planters as to the special demerits of various weeds. One considers the white-weed (*Ageratum conyzoides*) the most objectionable, another dislikes still more *Portulacca*, in another estate a kind of sow thistle (*Gynura*) is most strongly objected to. All agree, however, in the injury caused by Lalang, and in sandy places, where it can grow, the Victoria grass, *Panicum repens*.

There is no cure for weeds on ground required for cultivation, for any weed killer that will kill weeds will kill any other plant of an equally high order. The weeds must be hoed out, and it is important to do so before the seeds are ripe, or they will fall when being hoed up and the weeds soon re-appear.

A COFFEE LEAF FUNGUS.

Mr. PRIOR sends some leaves and berries of Coffee affected by an unpleasant looking disease in the form of a mould. The leaves are dead and black and covered all over the back with a fine white mycelium. The twigs are also covered with it in thicker strands, no fruit is to be seen on it. The berries yet unripe have large brown blotches of decay extending through the husk, and depressed on the outer surface and covered also with this fine mycelium. He states that it is doing much damage. I have known this fungus for very many years, and have never yet been fortunate enough to find its fruit. When the late Mr. ROBERTSON,

Glasgow, was in the Malay Peninsula studying the fungi I called his attention to it but he likewise did not get the fruit. I have suspected it to be the immature state of a species of Corticium, which genus is a very pestilential plant destroyer. It only, so far as I know, appears in wet weather, and usually in damp spots in the Coffee estate, especially on trees near and shaded by the forest which during the wet season do not get enough sun to dry the leaves. In dry weather, it seems quite to disappear. The obvious thing first, if it appears on trees near jungle edge, is to cut the trees of the forest back so as to let the coffee bushes get more light and air, and to cut off all infected twigs, leaves, and berries and destroy them, and should it show signs of very rapid growth, to spray the bushes with Bordeaux Mixture.

The appearance of this fungus, however, may be considered as a sign that the estate is too damp in the places where it occurs, and steps should first be taken to make it dryer.—Ed.

Re—ASTYCHUS CHRYSOCHLORIS.

Lanadron Estate, Muar,
Via Singapore,
Straits Settlements,
3rd October, 1904.

The Editor,

The Agricultural Bulletin of the Straits & F. M. S.

Dear Sir,

I have read with interest the letter in your July issue from Mr. F. C. Robinson on the beetle Astychus Chrysochloris:—I was surprised to see that he lays special emphasis on the "well known habit of the family of shamming death on the slightest alarm," for I have not found this at all the case with the numerous specimens I have caught here. On the contrary, when disturbed they at once hide behind the leaves of the tree or else attempt to escape by running along the twigs or branches. When the tree or branch on which they are is shaken they will drop off as though falling to the ground, but when still about 3 ft. from the ground they fly away, thus rendering themselves very difficult to follow.

This being so, might it not be possible that there are two beetles, somewhat similar in appearance but different in habits?

I remain, dear Sir,
Yours faithfully,
Roger Pears.

HIGH PRICES OF PARA RUBBER.

The Ceylon papers write jubilantly of Ceylon rubber as having beaten the record of high price for Para rubber at 5*s*. 9½*d*., but as a matter of fact it appears that Perak rubber had already reached that price. A still higher price of 6*s*. is said to have been given for some Ceylon rubber, but from the following extract from the "*Straits Times*," November 29, 1904, we see that Perak rubber still keeps ahead of Ceylon, fetching 6*s*., while Ceylon was only quoted at 5*s*. 9½*d*.:—

"RUBBER continues to go up. Messrs. SANDILANDS, BUTTERY & Co., of Penang, have just been advised that one of their consignments of fine dry well-cured pale Perak-grown 'biscuit' has fetched 6*s*. 1*d*. per pound. This is good news indeed, and establishes a record for F. M. S. rubber. Elsewhere the prospects of rubber plantations are becoming successful. The outlook in Burma seems to be excellent. A Rangoon firm which took up 2,000 acres in the Shwegyin Sub-Division has applied for 5,000 acres in addition, to extend its plantation. Good roads are badly wanted in that part of the Province, for, as yet, though only a few miles from the railway, planters are cut off from it most of the year by thick jungles or impenetrable swamps. Another Rangoon firm has a rubber plantation near the Leiklho Hills, in the Toungoo District, which is most favourably situated as regards water-supply and where plants of two and three years' growth are in excellent condition. Besides these two plantations financed by Europeans, many Burmese and Karens have small plantations, and the Government plantation in the Mergui District should soon be in a position to export rubber. In the presence of the rising prices of rubber in the markets of the world, there seem to be excellent prospects for the Burma rubber plantations."

These high prices, however, must be looked on rather as fancy ones, and are not to be expected as a permanent possibility. They are chiefly interesting as showing that first class rubber is badly wanted just now, and that Malay rubber is still the first in the world, always keeping a little ahead of Ceylon.

The "*India-Rubber Journal Market Chart*" for Fine Para shows that the prices have fallen but are on the rise again. In August the price is given at 5*s*. 2½*d*. which is the highest record in four years. The price then fell to 4*s*. 9½*d*. in September and rose in August and November to 4*s*. 11¾*d*.

SOY AND BEAN CHEESE.

Among the number of small manufactures by natives in Singapore, many of which are quite unknown to the ordinary residents, the manufacture of the Chinese sauce known as Soy, is one of some interest and importance, and having had occasion lately to visit three of these factories, I put together such notes on

the manufacture as I was able to make. Soy is made from the seeds of the bean *Glycine hispida*, which is cultivated in China and also in India, and the beans are imported from China to Singapore for making Soy and Bean-cheese.

The present price of the beans is high, six dollars a picul, probably owing to the Russo-Japanese war.

The Soy beans are first boiled, which causes them to swell up considerably, and then put into stone jars about three feet tall and two feet across, with a quantity of brine made of coarse salt, which I was told was made of equal parts of salt and water. The brine is first made in jars, and occasionally skimmed as the extraneous matter floats to the top. The jars when full of beans and brine are covered on wet or dull days with a conical tin cover which is taken off in sunshine. At one factory I was told that wheat flour was put into the jars with the beans, and a note in "*Spon's Encyclopædia*" states that an equal quantity of roughly ground barley or wheat is boiled with the beans, but this does not appear to be done here.

The beans are left to soak for from sixteen days, when there is a big demand for the product, to a year, and the longer it is kept the better the Soy is considered. Six to eight months, however, seems the usual length of time.

The beans are then strained out, squeezed in a cloth, and the deep brown liquor filtered through a cloth laid in a rattan basket, and then boiled. It is afterwards poured into stone jars such as the Chinese use for their pickled cabbages, and sold to various places in the East.

I could not find that any ferment was added to produce fermentation of the beans, and the Chinese said there was none. There is, however, a general idea of there being some secrets, known only to the head man and religiously preserved by him, as to the manufacture. This is, however, commonly stated by any Chinese manufacturer, however simple and well known his manufacture may be.

There are two kinds of beans of the *Glycine*, black and white, which are used separately.

Soy is extensively used as a condiment both by Chinese and Europeans in the East, and forms the basis of most of the sauces used throughout the world.

Bean Cheese.

Bean cheese or bean-cake, is also make from the Soy beans, but the white ones only are used. The beans are first cracked in a stone quern or mill, worked by hand, the beans being poured through a hole in the upper millstone. They are then immersed in water for a day, which causes them to swell. Then they are transferred to another quern and ground to the consistency of a cream. This is boiled and when cool poured into a cloth and squeezed and pounded on a small table with a square hole in the centre till much of the water is squeezed out, when the cheese is made into square flat cakes four or five inches across

and about $\frac{1}{2}$ or $\frac{3}{4}$ inch thick, then wrapped in cloth and put each in a little rattan tray or dish, they are put over a low fire, till they are firm enough. Some are coloured yellow by a decoction of the seeds of a capsular plant brought from China, the seeds being steeped in water and the liquid brushed over the top of the cheese. A little alum and a quantity of powdered gypsum is sometimes at least added to the bean cake during its manufacture. The former probably to make it whiter, the latter probably to increase the weight. The Chinese seem to be very fond of adding gypsum to such manufactured articles. It has been mentioned in an earlier *Bulletin* that it is mixed with Jelutong rubber.

Bean cheese is a very popular article of food with all kinds of natives, and costs about one cent a cake, and about 6 or 8 cents a pound.—ED.

SINGAPORE MARKET REPORT.

Singapore—December, 1905.

Articles.	Quantity Sold.	Highest Price.	Lowest Price.
	Tons.	$	$
Coffee—Palembang	5	29.50	29.50
Bali	...	27.00	26.50
Liberian	80	30.00	26.00
Copra	3,170	9.10	8.30
Gambier	2,078	9.75	9.12½
Cube Gambier, Nos. 1 & 2	285	14.50	13.00
Gutta Percha, 1st quality	...	200.00	150.00
Medium	...	100.00	90.00
Lower	...	80.00	19.00
Borneo Rubber, 1st, 2nd, 3rd	...	138.00	90.00
Gutta Jelotong	...	8.25	7.40
Nutmegs, No. 110's	...	42.00	39.00
No. 80's	...	64.00	62.00
Mace, Banda	...	100.00	95.00
Amboyna	...	73.00	70.00
Pepper, Black	221	29.25	28.25
White (Sarawak)	419	42.50	40.00
Pearl Sago, Small	75	4.50	3.80
Medium	...	...	...
Large	...	...	...
Sago Flour, No. 1	3,002	3.55	3.30
No. 2	415	1.22½	1.10
Flake Tapioco, Small	542	4.45	4.35
Medium	20	...	...
Pearl Tapioca, Small	536	4.40	4.30*
Medium	723	4.35	4.25
Bullet	...	5.50	5.50
Tin	2,270	81.62½	77.12½

* Closing fair.

Export Telegram to Europe and America.

For Fortnight ending 15th December, 1904.

		To.	Tons.
Tin	Str Singapore and Penang	U. Kingdom &/or ..	1425
Do	,, do	U. S. A.	505
Do	,, do	Continent	330
Gambier ..	,, Singapore	London	—
Do	,, do	Liverpool	350
Do	,, do	United Kingdom and /or Continent	675
Cube Gambier..	,, do	United Kingdom ..	110
Black Pepper ..	,, do	do	—
Do	,, Penang	do	—
White Pepper ..	,, Singapore	do	230
Do ..	,, Penang	do	20
Pearl Sago ..	,, Singapore	do	50
Sago flour ..	,, do	London	280
Do	,, do	Liverpool	1200
Tapioca Flake ..	,, Singapore and Penang	United Kingdom ..	480
Do Pearl ..	,, do	do	320
Do Flour ..	,, Penang	do	975
Gutta Percha ..	,, Singapore	do	10
Copra	,, Singapore and Penang	do	—
Buffalo Hides ..	,, Singapore	do	80
Pineapples ..	,, do	do	2500 cases
Gambier ..	,, Singapore	U. S. A.	170
Cube Gambier ..	,, do	do	20
Black Pepper ..	,, do	do	—
White Pepper ..	,, do	do	10
Black Pepper ..	,, Penang	do	—
White Pepper ..	,, do	do	30
Nutmegs ..	,, Singapore and Penang	do	6
Flake and Pearl	,, do	do	100
Pineapples ..	,, Singapore	do	—
Do	,, do	Continent	1250 cases
Gambier ..	,, do	S. Continent ..	210
Do	,, do	N. Continent ..	50
Cube Gambier..	,, do	Continent	60
Tapioca Flake ..	,, do and Penang ..	do	100
Do Pearl ..	,, do do ..	do	250
Copra	,, do do ..	Marseilles	760
Do	,, do do ..	Odessa	2750
Do	,, do do ..	S. Continent ..	640
Do	,, do do ..	N. Continent ..	100
Black Pepper ..	,, Singapore	S. Continent ..	280
Do ..	,, do	N. Continent ..	20
White Pepper ..	,, do	S. Continent ..	—
Do	,, do	N. Continent ..	80
Do	,, Penang	S. Continent ..	20
Do	,, do	N. Continent ..	10
Black Pepper ..	,, do	S. Continent ..	70
Do ..	,, do	N. Continent ..	—
Sago Flour ..	,, Singapore	U. S. A.	—
Do	,, do	Continent	700
Do	,, do	Glasgow	20
Gambier ..	,, do	Glasgow	—
Gambier ..	Slr do	U. S. A.	—
Flake and Pearl	,, do	do	—
Cube Gambier ..	,, do	do	—
White Pepper ..	,, do	do	—
White Pepper ..	,, Penang	do	—
Pineapples ..	,, Singapore	do	—
Gambier ..	,, do	S. Continent ..	—
Copra	,, do	Marseilles ..	—
Black Pepper ..	,, do	S. Continent ..	—
White Pepper ..	,, do	do ..	—
Black Pepper ..	,, do	U. S. A.	—
Do ..	,, Penang	do	—
Gambier ..	Contracts	.. .. ..	1150
Black Pepper ..			120

Export Telegram to Europe and America.

Fortnight ending 31st December, 1904.

		To.	Tons.
Tin	Str Singapore & Penang ..	U. Kingdom &/or ..	1835
Do	,, do	U. S. A.	925
Do	,, do	Continent	50
Gambier ..	,, Singapore	Glasgow	—
Do	,, do	London	—
Do	,, do	Liverpool	—
Do	,, do	U. K. &/or Continent	100
Cube Gambier ..	,, do	United Kingdom ..	5
Black Pepper ..	,, do	do	15
Do ..	,, Penang	do	30
White Pepper ..	,, Singapore	do	120
Do ..	,, Penang	do	40
Pearl Sago ..	,, Singapore	do	25
Sago Flour ..	,, do	London	—
Do	,, do	Liverpool	—
Do	,, do	Glasgow	—
Tapioca Flake ..	,, Singapore & Penang ..	United Kingdom ..	220
T. Prl. & Bull.	,, do	do	150
Tapioca Flour ..	,, Penang	do	675
Gutta Percha ..	,, Singapore	do	15
Buffalo Hides ..	,, do	do	40
Pineapples ..	,, do	do	4000 cases
Gambier ..	,, do	U. S. A.	1300
Cube Gambier ..	,, do	do	60
Black Pepper ..	,, do	do	75
Do ..	,, Penang	do	—
White Pepper ..	,, Singapore	do	55
Do ..	,, Penang	do	60
T. Flake & Pearl	,, Singapore & Penang ..	do	525
Nutmegs ..	,, do	do	19
Sago Flour ..	,, Singapore	do	120
Pineapples ..	,, do	do	5000 cases
Do ..	,, do	Continent	2750
Gambier ..	,, do	South Continent ..	25
Do	,, do	North Continent ..	175
Cube Gambier ..	,, do	Continent	35
Black Pepper ..	,, do	South Continent ..	—
Do ..	,, do	North do ..	90
Do ..	,, Penang	South do ..	—
Do ..	,, do	North do ..	—
White Pepper ..	,, Singapore	South do ..	—
Do ..	,, do	North do ..	110
Do ..	,, Penang	South do ..	—
Do ..	,, do	North do ..	30
Copra	,, Singapore	Marseilles	240
Do	,, do	Odessa	—
Do	,, do	Other S. Continent	—
Do	,, do	North Continent ..	940
Sago Flour ..	,, do	Continent	410
Tapioca Flake ..	,, Singapore & Penang ..	do	210
Tapioca Pearl ..	,, do	do	260
Copra	,, Singapore	England	—
Gambier ..	Slr do	U. S. A.	—
Cube Gambier ..	,, do	do	—
T. Flake & Pearl	,, do	do	—
Sago Flour ..	,, do	do	—
Gambier ..	,, do	South Continent ..	—
Copra ..	,, do	Marseilles	—
Black Pepper ..	,, do	South Continent ..	—
White Pepper ..	,, do	do	—
Do ..	,, do	U. S. A.	—
Pineapples ..	,, do	do	—
Nutmegs ..	,, do	do	—
Black Pepper ..	,, do	do	—
Do ..	,, Penang	do	—
White Pepper ..	,, do	do	—
T. Flake & Pearl	,, do	do	—
Nutmegs ..	,, do	do	—
Gambier ..	Contractors	.. .. ..	1300
Black Pepper ..			150

Rainfall for December, 1904.

Lumut	11.47	The Prison	3.99
Pangkor	14.02	Balek Palau	.99
Bruas	16.05	Pulo Jerojoh	4.98
Government Hill ...	4.42	The Fort	4.67

PRISON OBSERVATORY,
PENANG, *7th January*, 1904.

M. E. SCRIVEN,
Assist. Surgeon.

Kelantan.

Abstract of Meteorological Readings taken at the Duff Development Concession, Ltd., Kelantan, for the month of December, 1904.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
				Mean.	Mean.	Mean.						Ins.	Ins.
Kuala Lebir	...	...	...	84.8	70.0	14.8	...	...	...	...	...	20.22	5.46
Kuala Kelantan ...	...	...	...	81.9	73.9	18.0	...	...	...	...	...	7.75	1.18

SURGEON'S OFFICE,
4th January, 1905.

JOHN D. GIMLETTE,
Surgeon.

Meteorological Observations.

Table showing the daily results of the reading of Meteorological Observations taken at the General Hospital, Seremban, for the month of November, 1904.

Date.	Temperature of radiation. 9 H	15 H	Mean.	Maximum.	Minimum.	Range.	Temperature of radiation. Sun.	Difference sun and shade	Grass.	Difference shade and radiation.	Wind. Direction. 9 H	15 H	Temperature of evaporation. 9 H	15 H	Mean.	Computed vapour tension. 9 H	15 H	Mean.	Relative humidity. 9 H	15 H	Mean.	Clouds 0 to 10. 9 H	15 H	Mean.	Cloud and weather initials. 9 H	15 H	Mean.	Rain. Inches.
	o	o	o	o	o	o	o	o	o	o			o	o					o	o	o							
1	77	84	80.5	86	71	15	142	56	65	6	S.E.	S.E.	71.9	75.7	73.8	0.783	0.888	0.835	84	76	80	3	0	0	C	B	B	
2	81	84	82.5	86	73	13	151	65	65	8	E.	N.E.	72.6	75.7	73.7	.802	.888	.845	76	76	76	2	0	0	B	B	B	
3	76	85	80.5	85	73	12	139	54	65	8	N.E.	S.E.	74.3	71.8	73	.848	.781	.814	94	64	79	5	2	0	C	B	B	
4	78	85	81.5	85	73	12	116	31	66	7	S.E.	S.E.	72.9	71.8	72.3	.810	.781	.795	84	64	74	5	2	0	C	B	B	
5	78	82	80	83	74	9	111	28	65	9	S.E.	S.E.	74.6	73.6	74.1	.857	.830	.843	89	76	82.5	3	0	0	C	B	B	
6	77	86	81.5	85	73	12	134	49	65	8	S.E.	S.E.	73.6	71.2	72.4	.829	.763	.796	89	61	75	3	10	5	C	R	C	.18
7	76	79	77.5	86	70	16	152	66	65	5	N.E.	S.E.	74.3	75.6	74.9	.848	.888	.868	94	90	92	2	2	5	B	B	C	
8	78	85	81.5	86	73	13	125	39	65	8	S.E.	S.E.	74.6	73.4	74	.857	.826	.841	89	68	78.5	3	0	0	C	B	B	
9	78	78	78	85	72	13	125	40	65	7	S.E.	S.E.	72.9	72.9	72.9	.810	.810	.810	84	84	84	0	10	0	B	R	B	.53
10	79	78	78.5	85	72	13	142	57	65	7	N.E.	S.	73.9	74.6	74.2	.839	.837	.848	85	89	87	2	10	0	B	R	B	1.30
11	74	86	80	87	70	17	161	74	65	5	E.	S.E.	72.3	74.2	73.2	.793	.855	.824	94	68	81	10	2	0	R	B	B	.74
12	79	82	80.5	86	72	14	125	39	65	7	E.	S.E.	73.9	75.3	74.6	.839	.877	.858	85	80	72.5	2	3	10	B	C	R	
13	79	83	81	84	71	13	139	55	65	6	S.E.	N.	73.9	73	73.4	.839	.810	.824	85	72	78.5	0	0	0	B	B	B	
14	78	85	81.5	87	72	15	140	53	65	7	S.E.	N.	72.9	75	73.9	.810	.873	.841	84	72	78	0	0	5	B	B	C	.13
15	75	85	80	89	72	17	145	56	65	7	S.E.	S.E.	73.3	73.4	73.3	.820	.826	.823	94	68	81	3	0	0	C	B	B	.34
16	75	86	80.5	88	72	16	150	62	65	7	S.E.	S.E.	73.3	74.2	73.7	.820	.855	.837	94	68	81	3	2	0	C	B	B	
17	78	88	83	88	72	16	145	57	65	7	S.E.	S.E.	72.9	73.3	73.1	.810	.819	.814	84	61	72.5	5	2	0	C	B	B	
18	78	85	81.5	87	72	15	150	63	66	6	S.E.	S.E.	72.9	73.4	73.1	.810	.826	.818	84	68	76	2	2	0	B	B	B	
19	78	85	81.5	88	73	15	160	72	66	7	S.E.	S.E.	72.9	73.4	73.1	.810	.826	.818	84	68	76	3	0	0	C	B	B	
20	78	83	80.5	90	73	17	160	70	67	6	S.E.	S.E.	72.9	78	75.4	.810	.906	.883	84	85	84.5	3	0	0	C	B	B	
21	78	83	80.5	90	73	17	160	70	67	6	S.E.	S.E.	72.9	76.3	74.6	.810	.905	.857	84	80	82	3	0	10	C	B	R	.67
22	78	83	80.5	90	73	17	161	71	67	6	S.E.	S.E.	76.3	78	77.1	.906	.906	.931	76	85	89.5	2	0	0	B	B	B	
23	81	87	84	89	73	16	155	66	67	6	S.E.	S.W.	72.6	73.9	73.2	.802	.837	.819	76	65	70.5	0	0	0	B	B	B	
24	81	89	85	89	73	16	150	61	67	6	S.E.	S.E.	72.6	74.3	73.4	.802	.847	.824	76	61	68.5	0	0	3	B	B	C	
25	82	85	83.5	85	72	13	145	60	67	5	N.E.	N.E.	73.6	75	74.3	.830	.873	.851	76	72	74	0	10	2	B	R	B	.95
26	77	83	80	83	71	12	142	59	67	4	N.E.	N.E.	73.6	76.3	74.9	.829	.905	.868	89	80	84.5	3	5	10	C	C	R	
27	76	87	81.5	89	71	18	150	61	67	4	N.E.	S.E.	74.3	75.5	74.9	.848	.884	.886	94	69	81.5	2	0	10	B	B	R	.91
28	76	82	79	86	71	15	125	39	67	4	E.	S.E.	74.3	77	75.6	.848	.926	.887	94	85	89 5	2	10	10	B	R	R	.42
29	76	78	77	87	71	16	135	48	67	4	N.E.	E.	74.3	74.6	74.4	.848	.857	.852	94	89	91.5	2	10	5	B	R	C	.27
30	77	76	76.5	85	70	13	120	37	67	3	S.E.	E.	73.6	74.3	73.9	.829	.848	.838	89	94	91.5	5	10	3	C	R	C	1.70
																											Total	7.94

State Surgeon's Office, Seremban,
12th December, 1904.

W. L. BRADDON,
State Surgeon.

Muar.

Abstract of Meteorological Readings for December, 1904.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew point.	Humidity.			
			°F.	°F.	°F.	°F.	°F.					Ins.	Ins.
Lanadron Estate	..	..	80	86.5	71	15.5	73	..	..	..	..	7.28	1.93

MUAR, 3rd *January*, 1905.

ROGER PEARS.

Pahang.

Abstract of Meteorological Readings in the various Districts of the State for November, 1904.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
Kuala Lipis	...	...	...	94.0	70.0	17.83	...	...	...	...	...	8.75	2.59
Raub	...	...	...	88.0	70.0	13.16	...	...	...	...	...	6.26	1.54
Bentong	...	...	...	88.0	70.0	11.48	...	...	...	...	...	5.79	.79
Pekan	...	...	...	94.0	72.0	13.10	...	...	...	...	...	13.69	3.30
Temerloh	...	...	...	92.0	72.0	20.0	...	...	...	...	...	5.51	1.32
Sungei Lembing	...	...	...	85.0	67.0	18.0	...	...	...	...	...	9.65	2.15
Kuantan	...	...	...	87.0	76.0	11.0	...	...	...	...	...	27.26	2.78

STATE SURGEON'S OFFICE,
KUALA LIPIS, 12*th January*, 1901.

S. LUCY,
State Surgeon, Pahang.

Penang.

Abstract of Meteorological Readings for December, 1904.

District.	Mean Barometrical Pressure at 30° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
	Ins.	°F	°F	°F	°F	°F	°F	Ins.	%	%		Ins.	Ins.
Criminal Prison Observatory ...	29.913	152.8	79.8	89.6	73.5	16.1	74.8	.769	70.04	70	N.W.	3.99	2.70

C. MUGLISTON,
Colonial Surgeon, Penang.

PENANG, 9*th January*, 1905.

Perak.

Abstract of Meteorological Readings in the various Districts of the State for December, 1904.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall in 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
Taiping ...	...	156.	80.09	91.	70.	19.	76.14	848	...	82	...	9.77	2.09
Kuala Kangsar...	...	...	79.35	90.	69.	21.	75.29	825	...	82	...	5.51	1.29
Batu Gajah ...	...	164.	79.40	90.	69.	18.	75.52	832	...	83	...	12.01	1.52
Gopeng ...	...	...	79.00	91.	63.	28.	74.96	816	...	82	...	7.34	1.16
Ipoh ...	...	...	79.41	90.	70.	17.	75.68	840	...	83	...	7.70	1.27
Kampar ...	...	...	...	90.	69.	21.	...	...	...	...	...	9.32	1.49
Telok Anson ...	...	...	79.43	89.	69.	17.	76.31	864	...	86	...	9.54	2.50
Tapah ...	...	...	79.33	90.	67.	22.	75.84	846	...	85	...	11.94	1.50
Parit Buntar ...	...	...	79.81	88.	70.	18.	76.21	857	...	85	...	6.56	1.60
Bagan Serai ...	...	...	80.88	90.	70.	19.	76.03	833	...	78	...	17.63	3.65
Selama ...	...	...	80.39	89.	71.	18.	76.48	860	...	82	...	9.43	1.48

STATE SURGEON'S OFFICE,
9th January, 1905.

W. J. WRIGHT,
State Surgeon, Perak.

Selangor.

Abstract of Meteorological Readings in the various Districts of the State for November, 1904.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature. Mean Dry Bulb.	Maximum.	Minimum.	Range.	Hygrometer. Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.	Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
General Hospital, Kuala Lumpur	29.886	149.3	80.3	88.5	71.7	16.8	76.4	0.833	73.7	78	Calm	8.12	2.29
Pudoh Gaol Hospital ,,	..	..	..	..	..	..	..	..	..	..	..	9.15	1.99
District Hospital ,,	..	..	..	..	..	..	..	..	..	..	..	8.44	2.51
,, Klang	..	..	..	85.3	71.3	14.0	..	..	..	..	..	7.04	1.25
,, Kuala Langat	..	..	..	85.8	72.6	13.2	..	..	..	..	..	6.74	1.03
,, Kajang	..	..	..	91.5	73.4	18.1	..	..	..	..	..	6.24	1.62
,, Kuala Selangor	..	..	..	86.7	75.3	11.4	..	..	..	..	..	5.14	1.91
,, Kuala Kubu	..	..	..	89.2	72.3	16.9	..	..	..	..	..	12.27	2.92
,, Serendah	..	..	..	89.6	75.8	13.3	..	..	..	..	..	15.33	3.92
,, Rawang	..	..	..	84.9	70.7	14.2	..	..	..	..	..	8.10	1.53
Beri-beri Hospital Jeram	..	..	..	..	..	..	..	..	..	..	..	9.33	3.01
Sabah Bernam	..	..	..	..	..	..	..	..	..	..	..	3.65	1.00

State Surgeon's Office,
Kuala Lumpur, 21*st December*, 1904.

E. A. O. TRAVERS,
State Surgeon, Selangor.

Singapore.

Abstract of Meteorological Readings for December, 1904.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
	Ins.	°F	°F	°F	°F	°F	°F	Ins.	°F	%		Ins.	Ins.
Kadang Kerbau Hospital Observatory ...	29.923	135.3	77.7	85.1	72.4	12.7	76.2	8.50	75.1	84	N. E.	8.94	1.50

W. GILMORE ELLIS, *P.C.M. Officer.*

SURGEON'S OFFICE, 14*th January*, 1905.

A. B. LEICESTER, *M.D.*

Singapore:

KELLY & WALSH, LIMITED,

32, RAFFLES PLACE AND 194, ORCHARD ROAD.

1904.

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